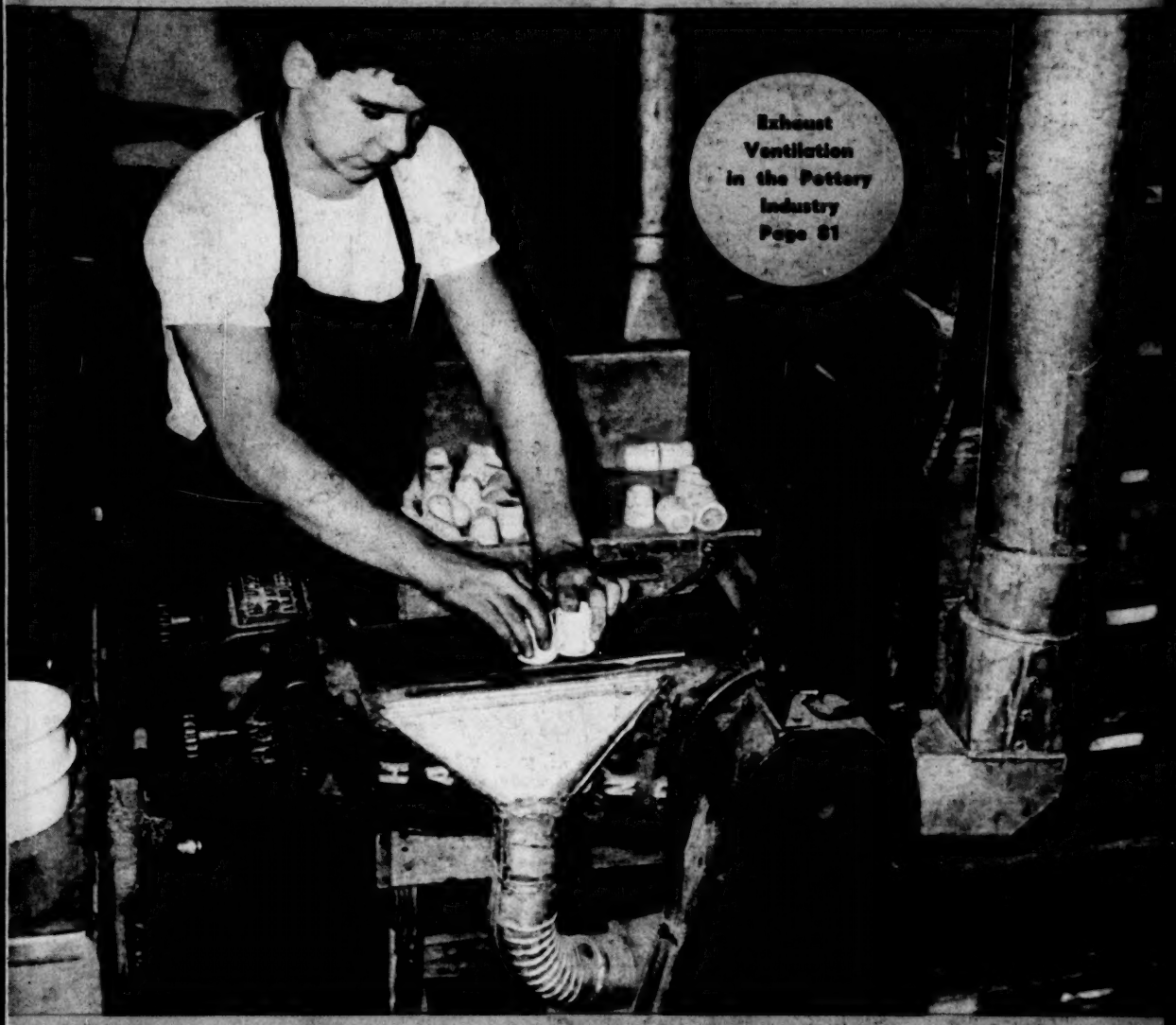
MARCH, 1951

HEATING AND VENTILATING

INCLUDING AIR CONDITIONING – PIPING – REFRIGERATION – AIR SANITATION



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Wing

THE first overhead suspended unit heater discharging vertically downward, was the Wing Full-height Unit Heater with stationary discharge outlets. The first unit heater with revolving discharge outlets was, and still is the Wing Revolving Unit Heater.

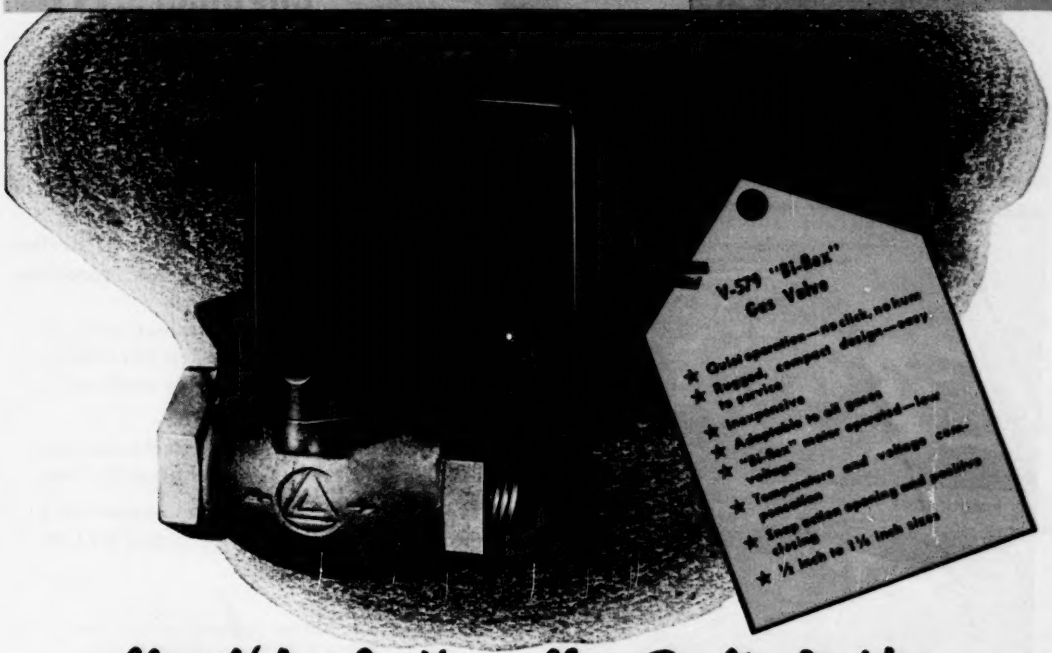
Only by means of the slowly revolving discharge can a room or building be heated evenly, thoroughly and comfortably. No fixed discharge outlet, however ~~scientifically~~, adjustable or replaceable, can distribute the warmed air throughout the working area without causing uncomfortable hot blasts or leaving cold spots—or doing an inadequate job of heating.

The Wing Revolving Heater, by means of its slowly moving discharge outlets, lays an even, gently sliding blanket of pleasantly warmed air over the working area, reaching and remain comfy, moving around and under obstructions and creating a healthful, live, invigorating atmosphere for the workers.

If you want specific information, consult Sweet's Catalog Files for the name of the nearest Wing Representative, or write direct.

L. J. Wing Mfg. Co., 153 Vreeland [illegible] Road, Linden, N. J., U.S.A.

demand DETROIT CERTIFIED CONTROLS


V-579 "Bi-flex"
Gas Valve
★ Quiet operation—no click, no hum
★ Rugged, compact design—easy to service
★ Inexpensive
★ Adaptable to all gases
★ "Bi-flex" motor operated—low voltage
★ Temperature and voltage compensation
★ Snap action opening and positive closing
★ ½ inch to 1½ inch sizes

New Value for Users—New Profits for You

From the Industry's Ablest Builder of Quality Controls!

The easiest thing in the world to sell is a good job at a low cost, and that's exactly what you can count on doing when you sell DETROIT Certified Controls. Why? Because DETROIT Controls are designed and built to fill your customers' needs—to give real economy and reliability through years of trouble-free service. And DETROIT'S new V-579 "Bi-flex" Gas Valve is no exception. Loaded with sales appeal, the new V-579 gives users, at low cost, an exclusive combination of outstanding features which provide new standards for the efficient and quiet operation of modern gas burning equipment. So insist that your source of supply furnish DETROIT Certified Controls with all your heating equipment—it will mean new value for your customers and assure new profits for you.

Write for Bulletin No. 229

No. 411 Thermostat—A sensitive and accurate *Timed Cycling* thermostat for all types of heating systems. Provides close control of room temperature. Attractively styled, easily installed and adjusted. Write for Bulletin No. 193 and Form No. 1545.

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LUBRICATOR COMPANY

9900 TRUMBULL AVE., DETROIT 8, MICHIGAN
Division of American Radiator & Standard Sanitary corporation
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DETROIT HEATING AND REFRIGERATION CONTROLS • ENGINE SAFETY CONTROLS • FLOAT VALVES AND OIL BURNER EQUIPMENT • DETROIT EXPANSION VALVES AND REFRIGERATION ACCESSORIES • STATIONARY AND LOCOMOTIVE LUBRICATORS

architect . . . Gustave W. Iser

and

engineer . . . R. W. Billharz

United on Sarcotherm Modulating Heat Control

To give these outstanding apartments perfect heating comfort under all weather conditions

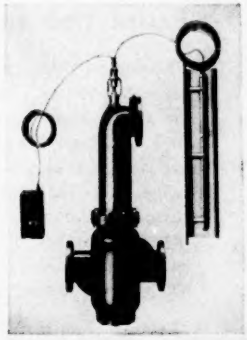
Yes, team work pays! It brings increased efficiency as well as superior design. The addition of Sarcotherm heat control to the combination made sure of owner satisfaction.

Sarcotherm is the simple, mechanical outdoor control, ideal for hot water or radiant heat.

For apartments, hospitals and institutions, it can be made fully automatic by adding the Centralized Program Panel.

Ask a Sarcotherm engineer to see you today. There is one near you. Or write for new bulletin ST-5011.

Typical centralized program panel.



Sarcotherm weather-compensated control valve.

20

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HEATING AND VENTILATING

A MONTHLY MAGAZINE FOR ENGINEERS AND CONTRACTORS CONCERNED WITH THE DESIGN AND APPLICATION OF AIR CONDITIONING, REFRIGERATION, PIPING, AIR SANITATION, HEATING AND VENTILATION IN BUILDINGS

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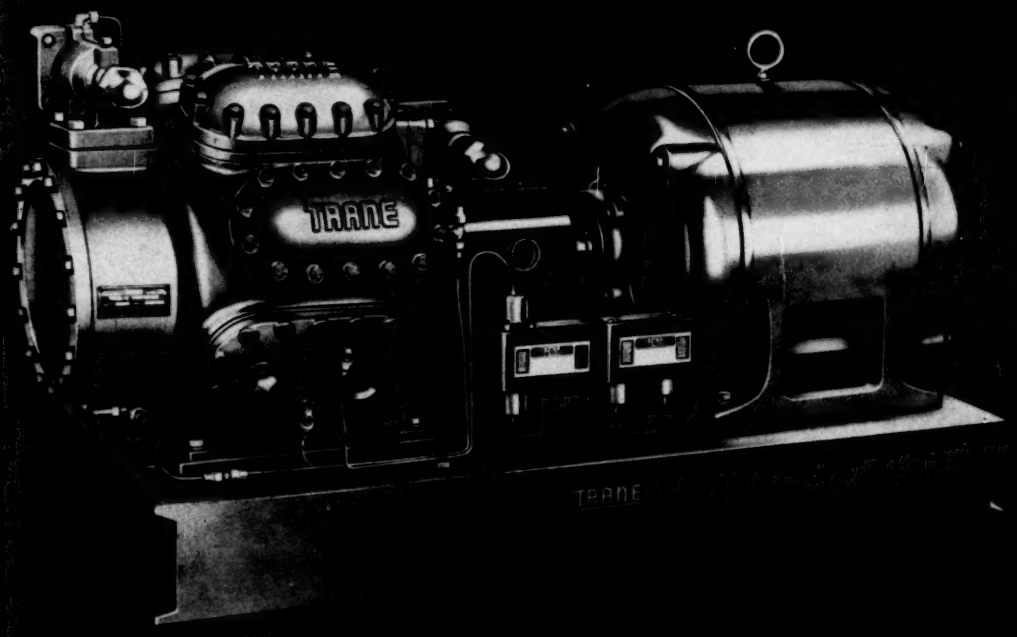
Also Publishers of
HEATING & PLUMBING EQUIPMENT NEWS
and technical books.

THIS MONTH'S COVER

To assure maximum dust control for a grinder in a pottery, a supplemental hood was installed along the edge of the sander belt as an exhaust for silica dust. See page 81. Photograph, courtesy Industrial Hygiene Foundation, Mellon Institute, Pittsburgh, Pa.

NEW TRANE COMPRESSOR...

New internal capacity control... new force feed oil system... new compact design



Full information and data on the new Trane Compressors available at your nearest Trane Sales Office, or at the main office in La Crosse, Wisconsin. See Reciprocating Compressor Bulletin DS-361

NEW REFRIGERATION EFFICIENCY

Saves space, cost, service on comfort and process applications

Brand new, all new, the Trane Reciprocating Compressor is designed to set a new high in refrigerating efficiency, performance and endurance.

The trim and compact Trane Compressor Unit is a real power-saver in operation. With its completely new, completely enclosed capacity control system, power consumption is reduced under reduced cooling loads. Trane Compressors automatically respond to load changes with favorable tonnage-to-horsepower efficiency even under greatly reduced loads. This smooth-running step-down and step-up operation requires no outside controls or adjustments.

Direct drive, constant speed design, plus unloaded starting, permit the use of standard general purpose motors. Special large-area filters cut wasteful oil foaming and pressure losses during start-up periods.

The new Trane Compressor is built for extra years of trouble-free service. Specially treated suction and discharge valves are designed to wear 900% longer; on test, needed no attention after the equivalent of 8 seasons of continuous operation. Bearings serve *years* longer because of an enclosed forced feed lubrication system. This system sends clean oil to bearings and prevents impurities from reaching bearings.

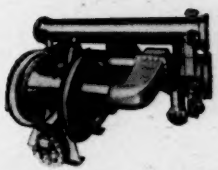
When it comes to quiet, vibration-free performance, the new Trane Compressor is a standout again. Special Trane designed valves are cushioned to muffle noise at its source. The internal capacity control system operates through oil pressures, silently and effectively.

So smooth running is the Compressor that a penny can be balanced on the machine through all stages of its operation!

The new Trane Compressor is available in six compact models, with 4, 6 or 8 cylinders. Capacities range up to 50 tons.

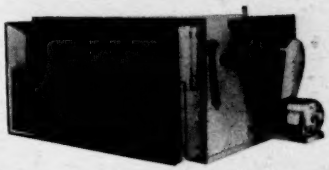
The new improved Compressor makes it easier and more logical than ever to design a complete air conditioning system around Trane products. Trane Fans, Coils, Climate Changers (for a central system), Custom-Air and UniTrane units (for a unit system), and Trane Compressors can work together to supply year-around comfort in any building. Individually, each of these products is outstanding. Working together, they are unmatched for air conditioning efficiency.

For full information about the new Reciprocating Compressor and Condensing Units, see the Trane representative in your area, or write the main office, La Crosse, Wisconsin.

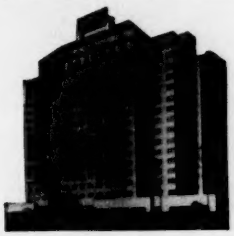


The New CenTraVac, a complete hermetically-sealed water chilling system, brings centrifugal refrigeration economies to a new and wider range of jobs. Direct drive, with automatic power reduction that parallels capacity reduction. Capacities starting from 45 tons. CenTraVac Bulletin DS-399 gives full information.

The 1951 Trane Self-Contained Air Conditioner supplies year-around comfort for stores, restaurants, offices. Uses less floor space. Delivers comfort directly or through ducts. Accessible hermetic compressors. Unit capacities up from 3 tons. See Self-Contained Air Conditioner Bulletin DS-362 for complete data.



The Trane Climate Changer is a complete year-around air conditioner, heating or cooling, humidifying or dehumidifying, filtering and moving air. It can do all, or any combination of these jobs for comfort or process work. Climate Changer Bulletin DS-303.



Luxury air conditioning for a luxury hotel—every room in the famous Shamrock Hotel in Houston is an oasis of air conditioned comfort. Trane-built room units form the system supplying this comfort.

TRANE

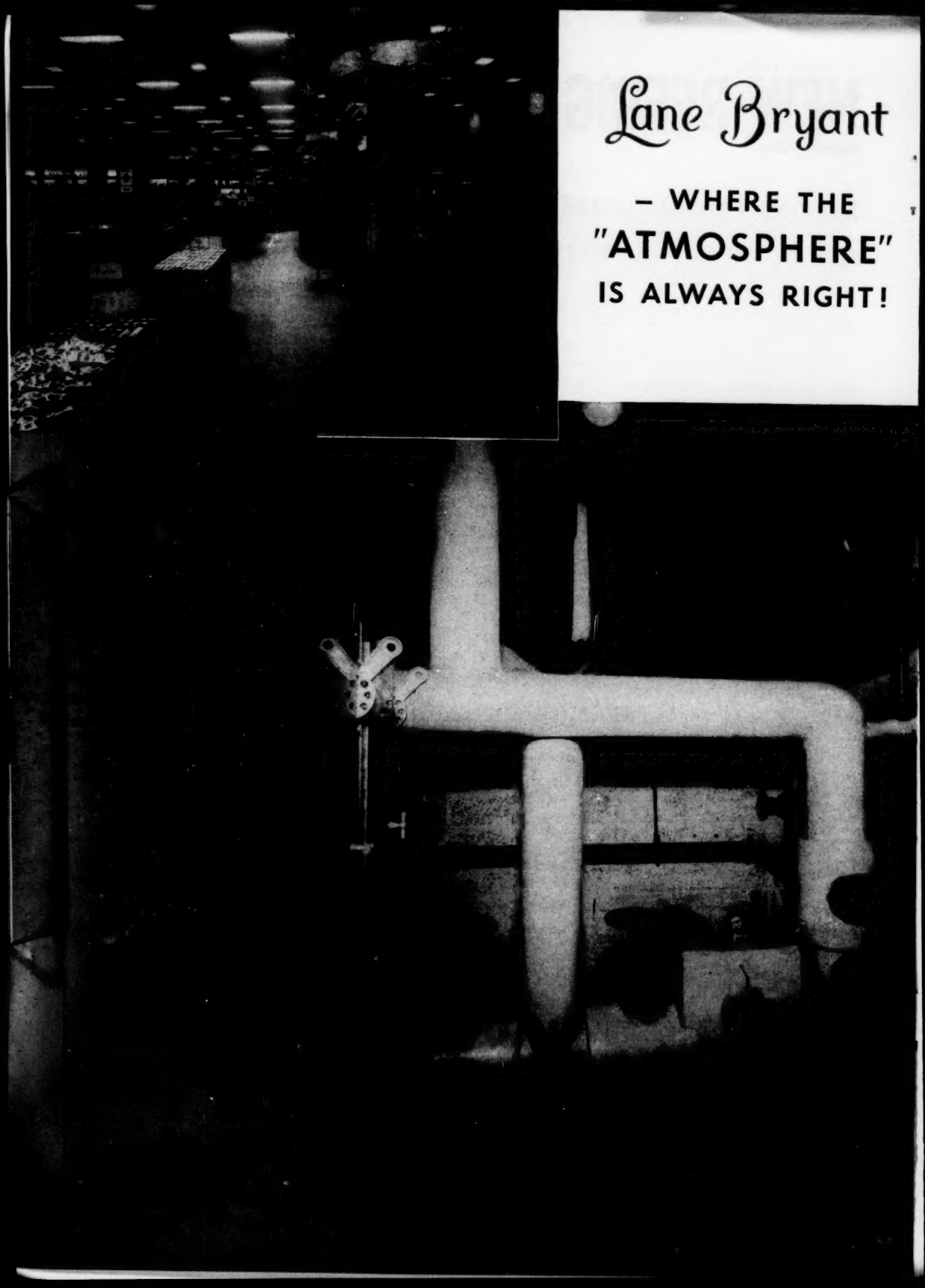
THE HOUSE OF WEATHER MAGIC

THE TRANE COMPANY, LA CROSSE, WISCONSIN

EASTERN MFG. DIVISION • SCRANTON, PA.

TRANE COMPANY OF CANADA, LTD., TORONTO

MANUFACTURING ENGINEERS OF HEATING AND AIR CONDITIONING EQUIPMENT • OFFICES IN 80 CITIES


Lane Bryant
– WHERE THE
"ATMOSPHERE"
IS ALWAYS RIGHT!

"Buffalo" FANS AND PC CABINETS

PROVIDE THIS *Atmosphere of Comfort*

● Lane Bryant stores are famous not only for their fine merchandise, but for their inviting atmosphere. "Buffalo" Comfort Conditioning Cabinets maintain the air comfort that's part of this "atmosphere", in their beautiful Pittsburgh, Pa. store shown in upper left.

For dependable, year-round air comfort so essential to the operation of any store, plant or public building, specify air handling equipment by "Buffalo", the name known favorably to industry for 73 years.

"Buffalo" builds a complete range of fans, pumps and air conditioning units. You can pick exactly the unit the job calls for, and be sure of "specified results". Write for bulletins on any phase of air handling.

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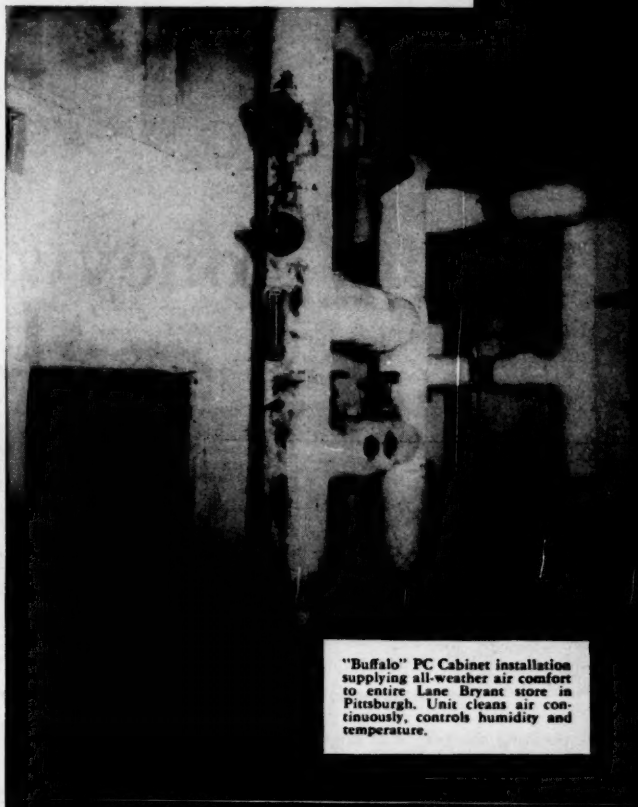
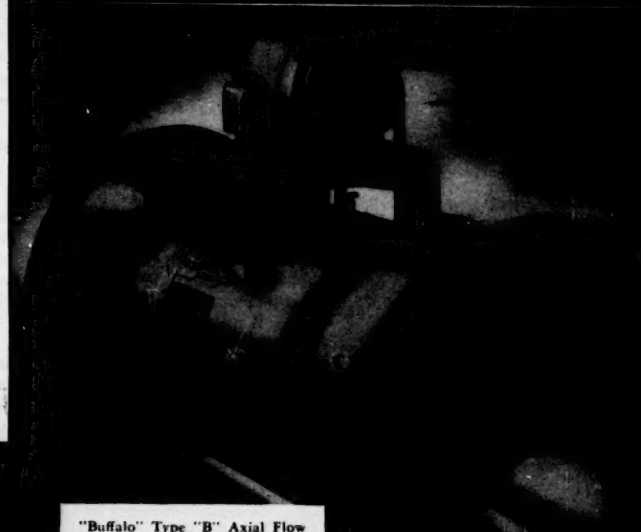
480 BROADWAY BUFFALO, N. Y.
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.
Branch Offices in all Principal Cities



"Buffalo" PC Cabinet installation supplying all-weather air comfort to entire Lane Bryant store in Pittsburgh. Unit cleans air continuously, controls humidity and temperature.



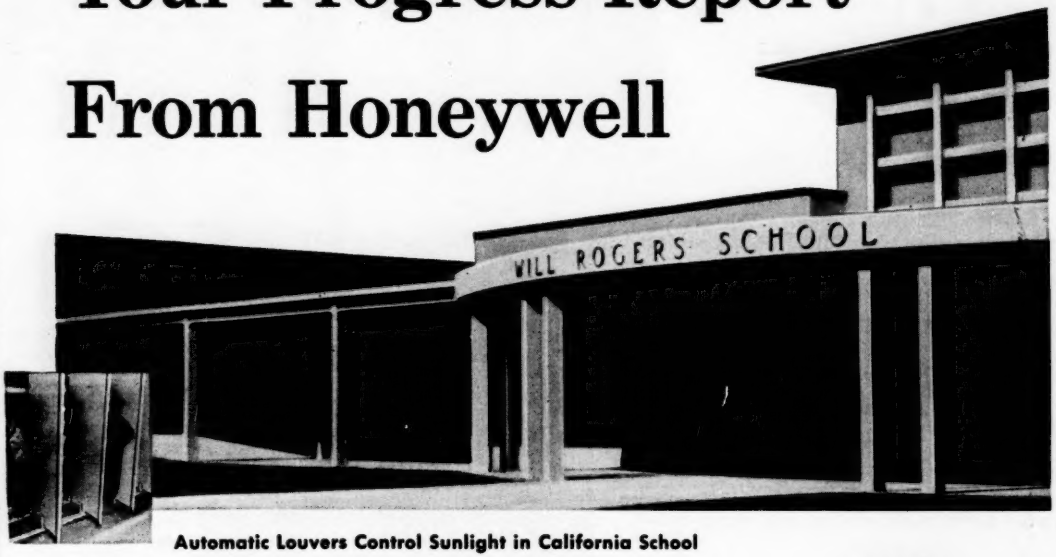
"Buffalo" Type "B" Axial Flow Fan, for mounting in straight runs of ducts . . . supplying air to air conditioning equipment, exhausting from hoods over vats, or boosting an existing system. Compact, light, easy to install. WRITE for BULLETIN 3533-C.

HOW DO YOU CONTROL SUNLIGHT AUTOMATICALLY?

WHAT'S THE NEWEST THING IN AIR CONDITIONING CONTROL?

HOW WILL TEMPERATURES HELP PATIENTS GET WELL AT ILLINOIS RESEARCH HOSPITAL? THIS IS . . .

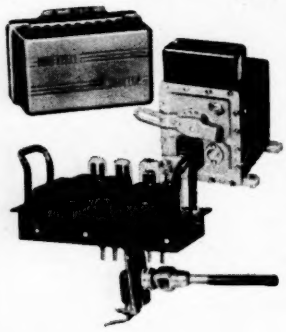
Your Progress Report From Honeywell



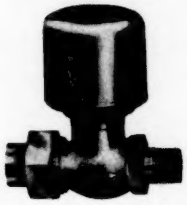
Automatic Louvers Control Sunlight in California School

In planning the new Will Rogers elementary school in Ventura, Architect Harold E. Burket wanted to "bring inside" as much of the mild out-of-doors as possible. But California law says no direct sunrays shall enter a school building! These giant louvers in the clerestory that adjust *automatically* to changing sun and cloud conditions proved to be the answer. Honeywell engineers, working with Mr. Burket, designed and installed controls that make sure the louvers obey the law—and still let in the maximum amount of daylight.

NOW! Electronic Air Conditioning Control!

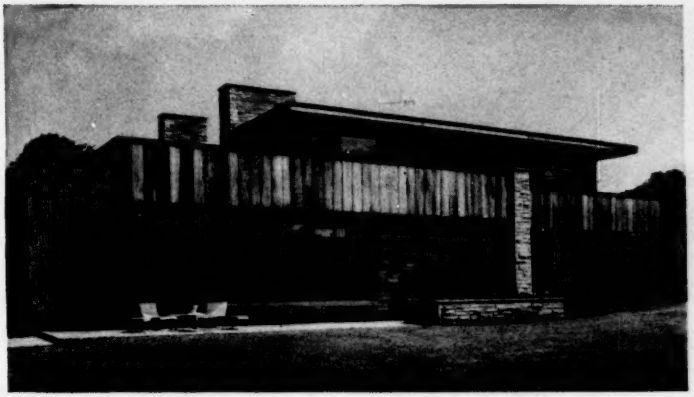


By applying electronics to air conditioning control, a new system has been developed that provides a new high standard of comfort. The electronic thermostat that controls heating and cooling in this new Honeywell system is up to *100 times more sensitive* than a mechanical thermostat. This means much faster reaction to changes in load; no temperature "over-shoot"; no waste of either warm or cool air. By specifying electronic air conditioning control you give your client the ultimate in comfort. And at the same time he's getting a system that helps pay for itself through increased efficiency and lowered maintenance costs.



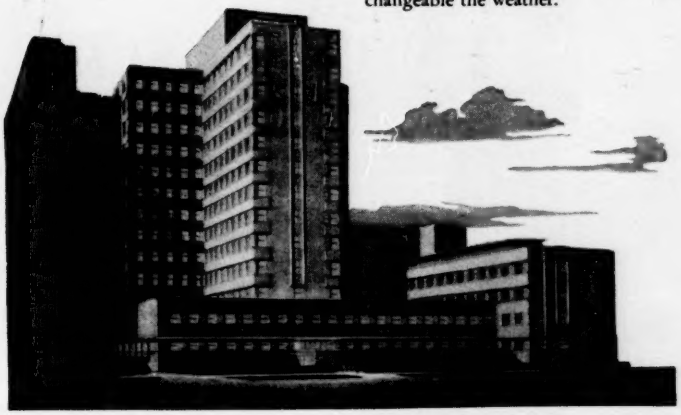
"Midget" Radiator Valve Ideal Space Saver

When the design of a building calls for pneumatic heat control, you'll find plenty of use for the VO501—the Midget radiator valve that's only *one-fourth* the size of the conventional valve. Its compactness makes it ideal for concealed convectors—and for all other applications where you're pressed for space. And because of its small size, it's easier to install and simpler to maintain. Special internal features enable the VO501 to give true modulation of heat delivery and the highest kind of performance.



Trend in Home Heating Is to Zone Control

With the accent on freer living and the rambling house, zone control of heating has now become recognized as the most practical way to meet the varying temperature needs of different "areas" in the home. In the house above, for example, Architect David Searcy Barrow found the best plan was to set up separate zones for the living-dining area, the sleeping area and the utility area. And with a Honeywell thermostat strategically located in each of the three zones, the whole house can be kept at the right temperature—no matter how changeable the weather.



University of Illinois Research and Educational Hospitals

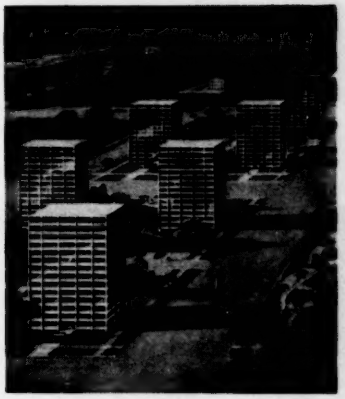
When the University of Illinois' new research hospital is completed on the school's medical campus in Chicago sometime this year, it will be equipped with medical science's latest and best instruments for probing the unknown.

Holabird & Root & Burgee,
Architects and Engineers, Chicago
Ernest L. Stouffer,
Supervising Architect, Urbana, Ill.

And playing an important part in helping to advance medical science will be Honeywell controls—controlling humidity, and furnishing the patients in each room with individual temperature control.

E. P. Heckel and Associates,
Special Consulting Engineers, Chicago
M. J. Corboy Company,
Mechanical Contractors, Chicago

MINNEAPOLIS
Honeywell
First in Controls



414 New Apartments—All With Personalized Heating Control

The Algonquin Apartments—made up of six of the country's finest functionally designed buildings—will be completed sometime this year on Chicago's South Side. Each of the buildings will have 69 apartments—and each apartment will be equipped with Honeywell personalized heating controls. And to make sure of trouble-free performance, the heating plant in each building will be controlled by a Honeywell Aquastat system.

Associated Architects: Herbert S. Greenwald,
Pace Associates, Chicago Sponsor
Ludwig Mies van der Rohe, Chicago

* * *

For additional information on any of the installations or products in this report, call your local Honeywell office. Or fill in coupon below and mail it to us *today*.

MINNEAPOLIS-HONEYWELL REGULATOR CO.
Dept. HV-3-23, Minneapolis 8, Minn.

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Please send me further information on

- ☐ Electric air conditioning control.
- ☐ Midget Radiator Valve.
- ☐ P H C for apartments.
- ☐ Zone control for homes.
- ☐ Hospital heating and air conditioning controls.

Name_____

Firm Name_____

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City_____

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Some of the Many Installations of

POWERS *Pneumatic* Temperature Control

IN CONTEMPORARY ELEMENTARY SCHOOLS

Assures Utmost Comfort and Efficiency of Teachers and Pupils

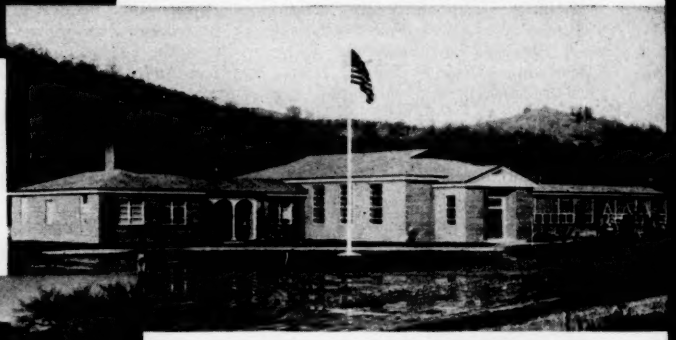
Lower Maintenance—Bigger Fuel Savings

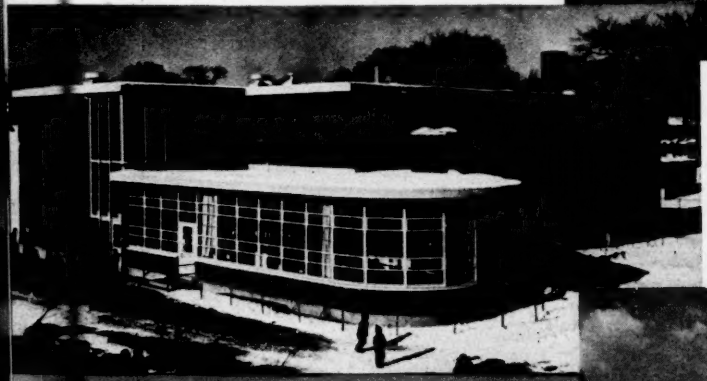
Many 25 to 40 year old installations still giving dependable regulation

. . . . . these and many other plus values in POWERS systems of temperature control give users more for their money

Above: Greenbriar School, Northbrook, Ill.
Architects-Engineers: Perkins & Will, Chicago—Mechanical Engineer: E. R. Gritschke—Heating Contractor: Northern Plumbing & Heating Co., Chicago

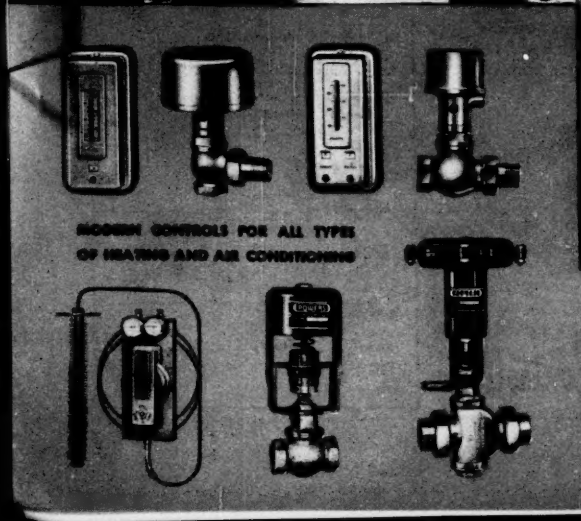
Right: Elm Hill School, Springfield, Vt.
Architect: Richard D. Butterfield, Perkinsville, Vt.—Engineer: Thomas Tash, Hanover, N. H.—Heating Contractor: Dezero & Randall, Rutland, Vt.





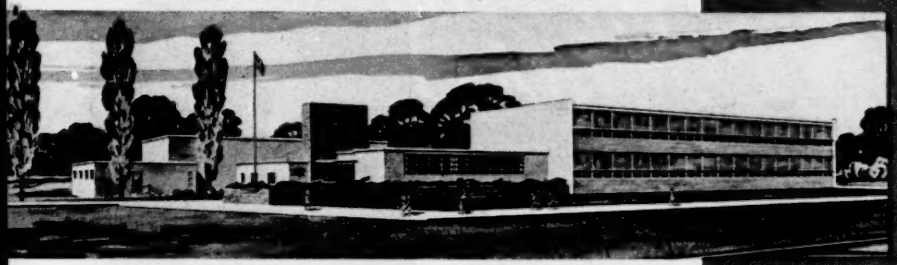
Left: Elementary School and Shop Bldg., Brewer, Me.
Architect & Engineer: Alonzo J. Harriman, Auburn, Me.—Heating Contractor: C. H. Babb & Co., Bangor, Me.

Below: North Norwood School, Norwood, Ohio.
Architect: Charles F. Cellarius, Cincinnati, Ohio—Engineers: Fosdick & Hilmer, Cincinnati, Ohio—Heating Contractor: B. & J. Jacobs Co.



Above: Carle Place Elementary School, North Hempstead, L. I., N. Y.

POWERS



Above: Porter School, Prairie Village, Johnson County, Kans.

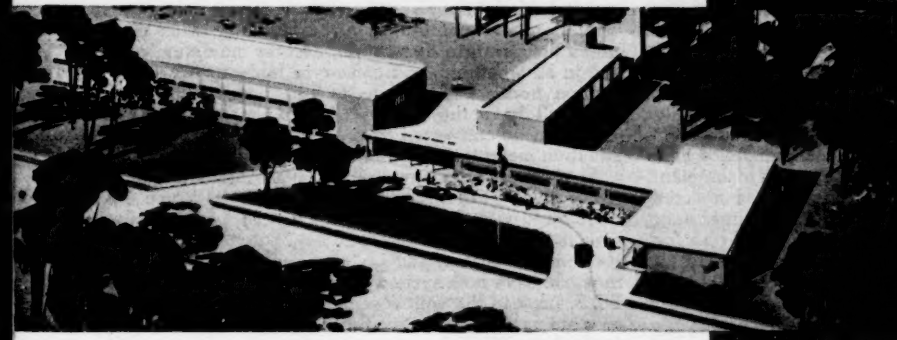
POWERS

Above: Conway School, Ladue, St. Louis County, Mo.

POWERS

Above: Sidney Lanier School, Dallas, Texas.

POWERS



POWERS

THE POWERS REGULATOR CO.

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MEXICO, D. F., Edificio "La Nacional" 601

(RCES)

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DRAVO HEATERS

Saved $530,000*

in mammoth new auto plant

*Compared with conventional steam system cost.

Half a million is important money in anybody's language —and it gets more important when it's SAVED instead of spent.

That's just what happened when a leading automobile manufacturer recently built a mammoth new body stamping plant, with over 600,000 sq. ft. of floor space, and with ceiling heights ranging up to 52-feet. Heat requirements, including fresh air tempering provisions, totalled 54,250,000 Btu. Lowest quoted price for a conventional steam boiler plant was $860,000. ACTUAL cost of a complete Dravo *Counterflo* Heater installation of 53 units was $330,000. These direct-fired warm-air heaters take care of all open-space heating requirements of the manufacturing area of the plant.

Bear in mind that these savings involved no compromise with heating effectiveness. The top-flight engineers responsible for selection knew how vital *comfort* is in keeping employes contented and promoting top output. They looked *first* for the finest in heating results . . . and *second* for economies. They found both profitably combined in Dravo Heaters.

Neither did this saving come from "cutting corners" in building the heater, but rather through the basic simplicity of method and equipment. Each of the oil-fired space heaters manufactures heat "on demand" to blanket its own assigned area with warmth. It also introduces fresh, tempered air into the building as needed. Modulating burner controls permit continuous operation and continuous air circulation. This minimizes temperature fluctuation, assures maximum comfort in all weathers, and conserves fuel—for when any section needs LESS heat, its unit burns LESS fuel. Units all have the Underwriters' Laboratories label. They can be converted from oil to gas, should the fuel situation make this desirable.

This spectacular saving has been duplicated on a lesser scale in thousands of smaller plants. If you are concerned with heating any new or old building, you owe it to yourself to find out how Dravo *Counterflo* Heaters are serving and saving for others . . . and how they can save both system costs and operating costs for YOU. Look in the yellow section of your phone book—or write us direct at Dravo Building, Pittsburgh 22, Pa., for Bulletin FG-523.

DRAVO

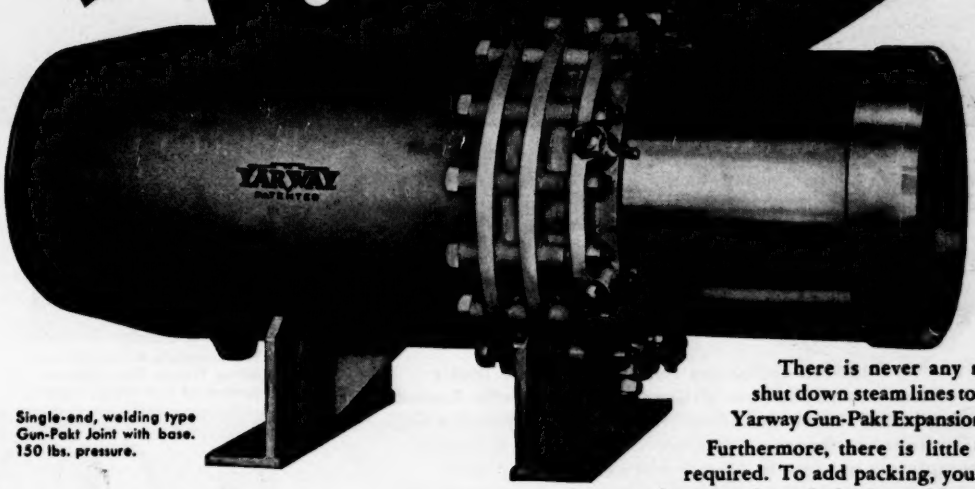
DRAVO CORPORATION

PITTSBURGH • CLEVELAND • PHILADELPHIA • DETROIT • NEW YORK • CHICAGO • ATLANTA • BOSTON

Sales Representatives in Principal Cities. Mfd. and Sold in Canada by Marine Industries, Ltd., Sorel, Quebec.

Export Associates: Lynch, Wilde & Co., Washington 9, D. C.

THIS EXPANSION JOINT IS SERVICED UNDER FULL STEAM PRESSURE



Single-end, welding type Gun-Pakt Joint with base. 150 lbs. pressure.

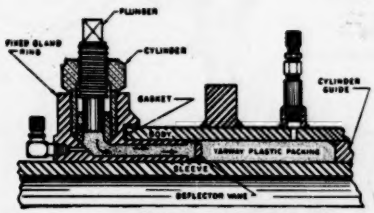
There is never any need to shut down steam lines to service Yarway Gun-Pakt Expansion Joints.

Furthermore, there is little service required. To add packing, you simply insert a plug of plastic packing, turn a wrench, and the job's done! Special Alemite fittings provide for proper lubrication.

Maintenance costs are trifling. One large user reports 65 cents per year per joint. Others claim less than that.

Gun-Pakt Joints are available with single or double-ends, welding or flanged types, in sizes from 2" to 30", with traverses from 4" to 24", and for pressures to 400 psi.

For the full Gun-Pakt story, write for Yarway Bulletin EJ-1912.



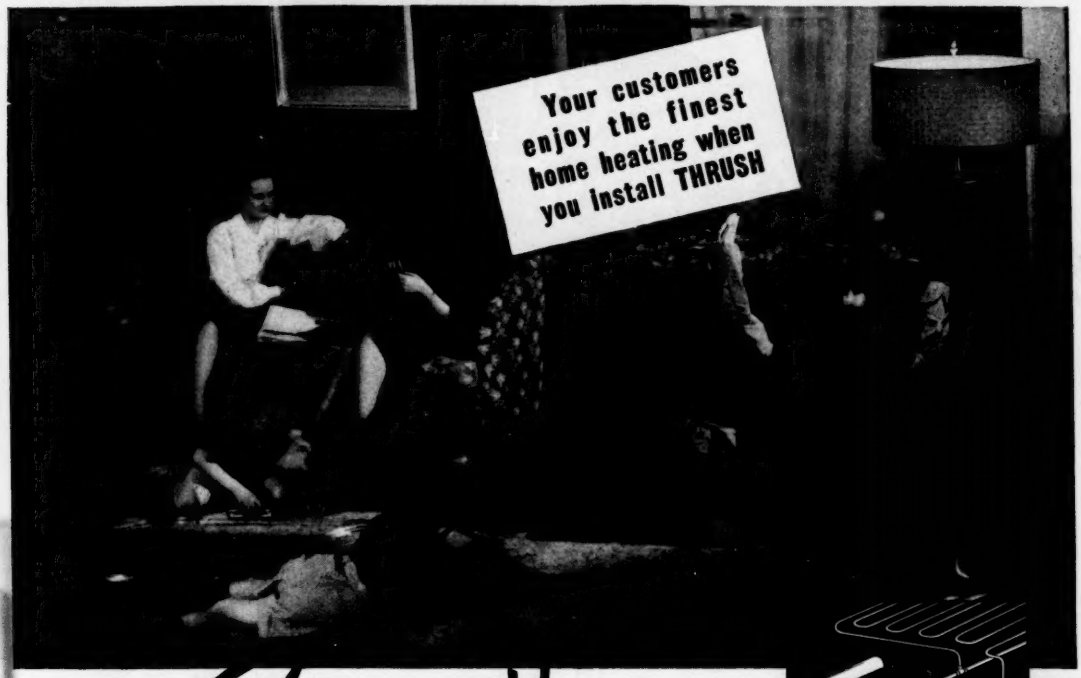
Close-up of cross-section showing detail of Gun-Pakt feature.

YARNALL-WARING COMPANY
104 Mermaid Avenue, Philadelphia 18, Pa.
Branch Offices in Principal Cities

YARWAY

GUN-PAKT EXPANSION JOINT

FORCED CIRCULATING FLOW CONTROL HOT WATER HEATING

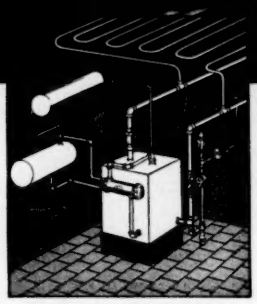


THRUSH Radiant Heat...

BETTER CONTROL AT LOWER COST

PLEASED customers tell their friends. That's the way to increase business . . . and profit. Forced Circulating Thrush Hot Water Heat, whether you use radiant panels, radiant baseboards, radiators or convectors, is simple, completely automatic, easy to install and low in cost.

It assures your customers automatic comfort in any kind of weather. There is no fuel waste because there is no over heating. It maintains a constant flow of radiant heat and provides plenty of hot water for kitchen, laundry and bath the whole year through. Get our booklet giving the complete story of Thrush Radiant Hot water heat. Ask your wholesaler about it or address Dept. D-3



The Complete Forced Circulating Thrush Flow Control System of Hot Water Heat

No. 201 Radiant Heat Control

Thrush Flow Control Valve with Air Vent Tube

Thrush Water Circulator

Thrush Hot Water Heater

OPERATING FLEXIBILITY

A CLEAVER-BROOKS STEAM BOILER GIVES YOU:

✓ **Quick, effortless response to fluctuating steam demands.**

✓ **Equally high efficiency (80%) operating with oil or gas.**

Fluctuating steam loads are no problem when you have a custom-planned Cleaver-Brooks boiler in your plant. Whether your demand is heavy or light, steady or variable, these sturdy heavy-duty boilers respond instantly to your steam needs. Even with loads as low as 30% of rating, Cleaver-Brooks boilers operate with a flat 80% efficiency.

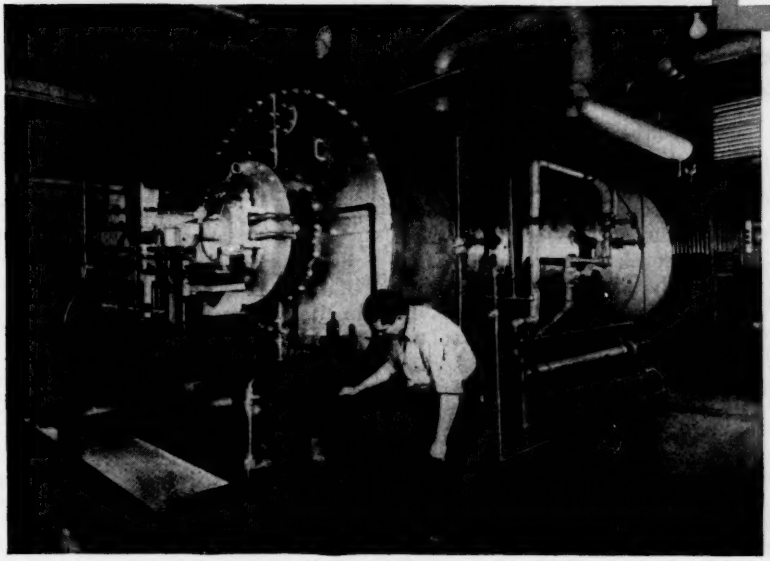
Cleaver-Brooks boilers burn either oil or gas . . . either fuel is properly proportioned to meet your steam demand and need. No banking of fires or loss of valuable heat during low load periods. You benefit with lower fuel bills, less maintenance, reduced operating costs.

If you are considering a change in your present boiler plant—think about flexibility — and get the complete facts about Cleaver-Brooks custom-planned boilers. Cleaver-Brooks self-contained boilers 15 to 500 HP, 15 to 250 lbs., p. s. i. — oil, gas, combination oil and gas firing. CLEAVER-BROOKS COMPANY, 366 East Keefe Avenue, Milwaukee 12, Wisconsin.

Cleaver-Brooks

STEAM BOILERS

the first and finest of their class



Write for a Cleaver-Brooks Steam Boiler Catalog.

PREFERRED

ALLENCO

Fire-Equipment

MORE THAN

3 TO 2

Information Institute recently asked 2836 Architects, Consulting Engineers, Contractors and Plumbing Wholesalers to *name the brand of fire-protection equipment they prefer.*

ALLEN

was noted by *more than* 3 for every 2 noting the next brand.

ALLEN

was noted by 40% more than *all other brands together.*

Details will be supplied on request.

SPECIFY

ALLENCO

TO BE SURE

A. I. A. file 29e2—Allen on Interior Fire-Protection — write for extra copies today.

Established 1887

W. D. ALLEN

Manufacturing Co.

CHICAGO 6 NEW YORK 7

What Part of a Building Can You Safely NEGLECT?

Of course no one would purposely neglect *any* part. But people naturally concentrate most on parts that cost most. Some may cost very little. Yet, because they require detailed specifications to be *right* or affect the building's function far beyond their cost-proportion, such parts warrant more attention than would at first thought seem necessary. One example is interior fire-protection equipment.

Depending on the intended use of the building, local codes and other requirements, fire-equipment may range from handy extinguishers to independent water systems with sprinklers and/or hose. Most include cabinets or other installations which are part of the actual construction. Many involve special valves, fittings, hydrants, standpipes, manifolds, etc.

Aside from other considerations, almost every such part must meet detailed requirements of local fire regulations. Because the codes differ, even "standard" units must be selected from several variants. The most prominent line of cabinets, to name only one part involved, necessarily provides for nearly 200 variations in dimensions and materials and design. Clearly, the right equipment cannot be specified glibly.

How Important is Fire-Equipment?

Functionally, of course, it is downright essential. Like a safety valve, it may serve without actually operating; when its emergency arises, it *must* operate successfully. Incidentally, it affects insurance rates and income of a warehouse, for example, and several aspects of any building's service.

Otherwise, fire-equipment is important as it affects design and construction and complexion of the structure. Recessed cabinets require special care in wall construction but add to useable space. Face-flush Hydrants and Siamese may involve extra detail but avoid ugly and personally injurious projections. Many other and more fundamental examples suggest that fire-equipment *is* important, deserves more attention than its minor cost would indicate.

Is All Fire-Equipment "Equal"?

Equality depends on adequacy of the specifications. In valves, couplings, reducers, etc., there may be little difference between brands in *operation*. So with products bearing Underwriters' or Factory Mutuals approval. Other products, such as hose racks, may vary widely in speed and flexibility of action.

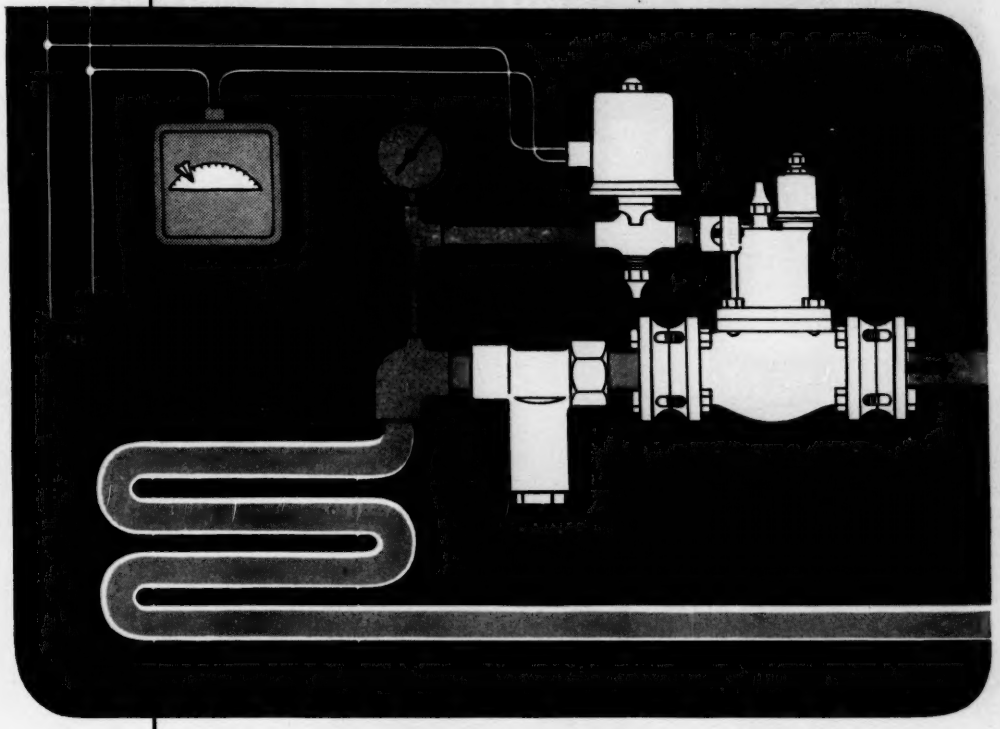
But there are other fields where important differences arise. Take two brands of cabinets, each having the same general dimensions and type of material and design. One will fit right in the assigned recess; the other, due to lighter gauge metal or looser joints, will require re-shaping on the job—perhaps even buckle—at best add cost and delay.

Connections may be found threaded just off specification, impossible to install. Replacement holds up the job. (One manufacturer even checks "specs" against appropriate code requirements, often saves you considerably.) Delivery of one brand may be *promised* sooner than another. But which would actually *be* delivered when you want it? One brand is *definitely preferred* over all others.

How Can One Get Details, Simply?

Of the 10-12 leading manufacturers in the fire-equipment field, two make the bulk of non-sprinkler installation equipment. One is noted for its complete line, long record (64 years) of reliability, thorough and concise catalog (A.I.A. file 29e2), and nationwide consulting service. For conference or catalog, write W. D. Allen Manufacturing Co. in Chicago.

ALCO SOLENOID-EPR COMBINATION for TEMPERATURE DIFFERENTIAL CONTROL



Try this performance-tested ALCO team—the EPR for accurate evaporator pressure regulation, *plus* the Solenoid for positive suction stop. Together, they solve the toughest close-control problems.

This ALCO Solenoid-EPR Combination is widely used on installations where pinpoint control is important: in the handling of plasma, biologicals, plastics and synthetics, and for food preservation on commercial and combatant ocean vessels throughout the world.

Try it on your next job where close control counts.

For further details, write for Bulletin 183.

Designers and Manufacturers of Thermostatic Expansion Valves; Evaporator Pressure Regulators; Solenoid Valves; Float Valves; Float Switches.

SEE YOUR ALCO WHOLESALER

ALCO VALVE CO.

859 KINGSLAND AVE. • ST. LOUIS 5, MO.

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ARE YOU WORKING ON ANY PROBLEMS INVOLVING THE INSULATION OF PIPES? LET THIS HELPFUL FACT FINDER GIVE YOU . . .

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UNIBESTOS No. 750
—for temperatures up to 750° F.
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WRITE today, on your company letterhead, giving your title or function. A "Fact Finder" will be sent to you together with complete information on UNIBESTOS Pipe Insulations No. 750 and No. 1200.

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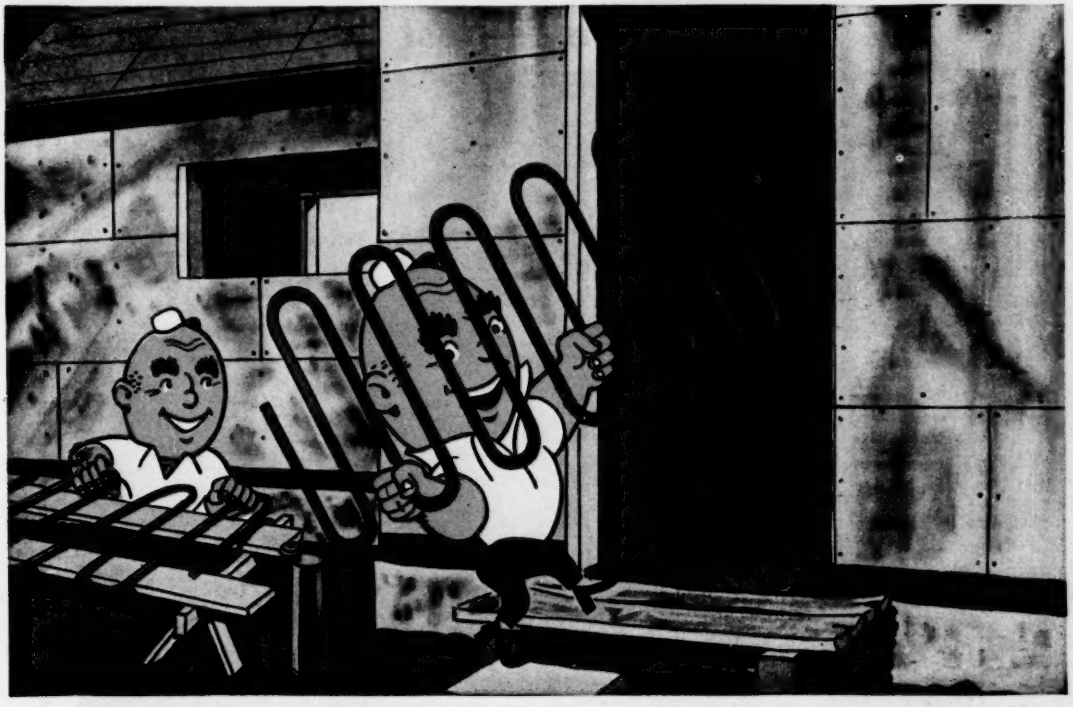


Bundyweld . . . right in your homes for better radiant heating

Unique construction, unique advantages—that's why!

Bundyweld is the only tubing double-walled from a single strip. It's extra-strong. Copper-brazed through 360° of wall contact, it's leakproof. It's double-walled, yet thinner-walled . . . *right* for faster-heating, more effective systems in your houses.

It's *right* for easier handling, too, on your building site. From its arrival in twenty-foot lengths (one end expanded when specified) to final installation in your ceilings, walls, or floors, tough Bundyweld rides over jolts, knocks, and jars. On a simple fixture, one man easily bends ductile Bundyweld to short radii, with no danger of structural collapse. Formed grids are easily joined, joined grids quickly positioned.

Briefly, when Bundyweld goes to work on your job, time, labor, materials savings, and better all 'round radiant heating go with it. Check Bundyweld today. For details, see *Sweet's Architectural File.* Or write: ***Bundy Tubing Company, Detroit 14, Michigan.***

Bundyweld® Tubing

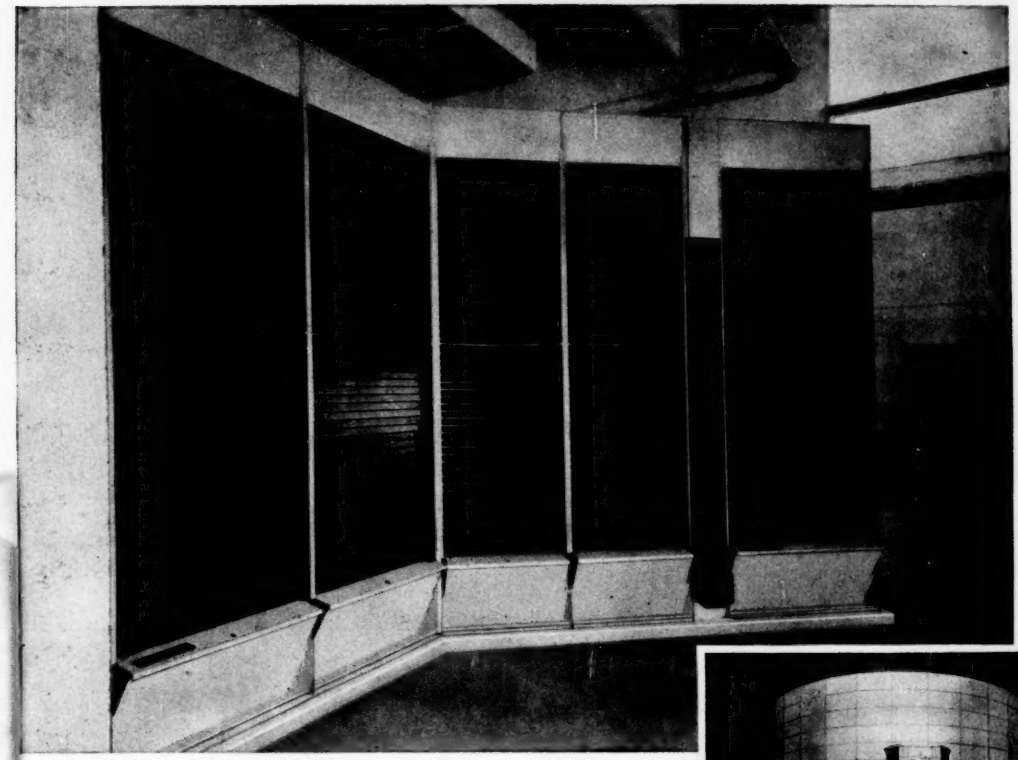
DOUBLE-WALLED FROM A SINGLE STRIP

WHY BUNDYWELD IS BETTER TUBING

Bundyweld starts as a single strip of basic metal, coated with a bonding metal. Then it's . . . continuously rolled twice around laterally into a tube of uniform thickness, and passed through a furnace. Bonding metal fuses with basic metal, presto— Bundyweld . . . double-walled and brazed through 360° of wall contact.

NOTE the exclusive patented Bundyweld beveled edge, which affords a smoother joint, absence of bead and less chance for any leakage.

today's best buy is better air!



Berkley (Calif.) High School Auditorium
Architect: Henry H. Gutterson, San Francisco
Consulting Mechanical Engineer: G. M. Simonson, San Francisco
Contractor: Marelich Mfg. Co. Inc., San Bruno

AAF MULTI-DUTY

most widely used automatic air filter in the world

Here Multi-Duty goes to school, though it's just as popular for rugged service in steel mills or defense plants.

When Berkley, California built its $3,000,000 high school auditorium it did things in a big way. This marvel of construction seats 3500 people and its ventilation system supplies 156,000 C.F.M. of clean air for their comfort. Such a large air volume should have automatic filtration and that's why the AAF Multi-Duty installation shown above was selected for this project.

The Multi-Duty automatic filter, because of its self-cleaning feature, is ideal for applications of this type where ventilating systems are not in continuous use. The filter is always in efficient operating condition without depending on the human element.

The exclusive principle of overlapping panel construction in the Multi-Duty was introduced by AAF in 1927. It is still the most practical method of combining the function of self-cleaning with the operating cycle. Although there have been numerous improvements in the design of individual panels and in unit construction, this basic principle has never been surpassed.

For detailed and illustrated description of Multi-Duty write today for Engineering Bulletin No. 241-B.

AAF American Air Filter COMPANY, INC.

294 Central Ave., Louisville 8, Kentucky • In Canada: Darling Brothers, Ltd., Montreal, P. Q.

perfected engineering

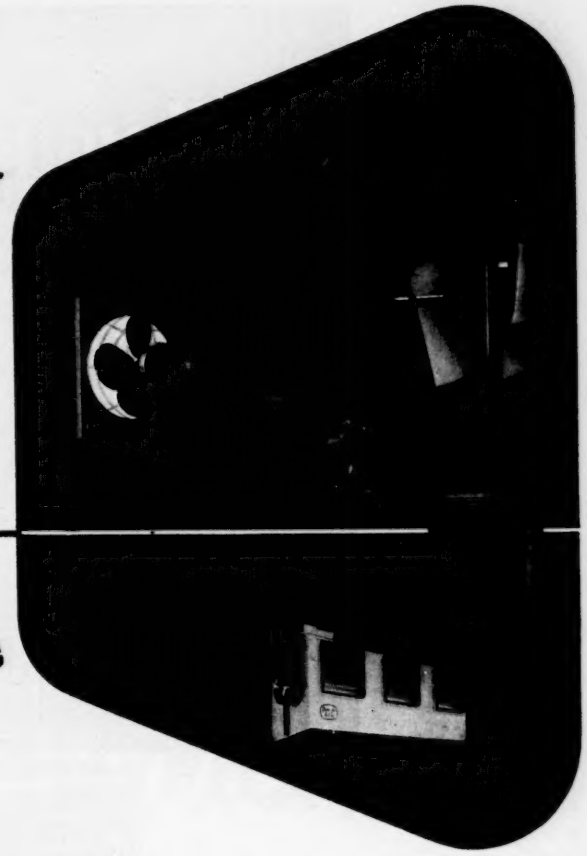
precision manufacture

certified ratings

nyb

responsible guarantees

of dependable performance



Wherever air is handled mechanically, whether for ventilation, heating or process, the name New York Blower enjoys an enviable reputation. ***nyb*** on a product means that the engineering knowledge acquired through sixty-one years of manufacturing experience and development is built into it.

Are you using AIR to the best advantage in your production methods to cut costs, increase efficiency, reduce absenteeism, safeguard health, bring comfort to workers...or applying it to process control for precision manufacture and more uniform products?

When working on your air handling problems, consult the ***nyb*** representative nearest you in our nationwide service.

write for bulletins

SEE OUR CATALOG IN SWEET'S

IUHA HEAT WITH UNIT HEATERS

NAEM

nyb

THE NEW YORK BLOWER COMPANY

GENERAL OFFICES • 32nd STREET & SHIELDS AVENUE • CHICAGO - 16

FACTORIES AT LAPORTE, INDIANA AND CHICAGO, ILLINOIS

call your cfm

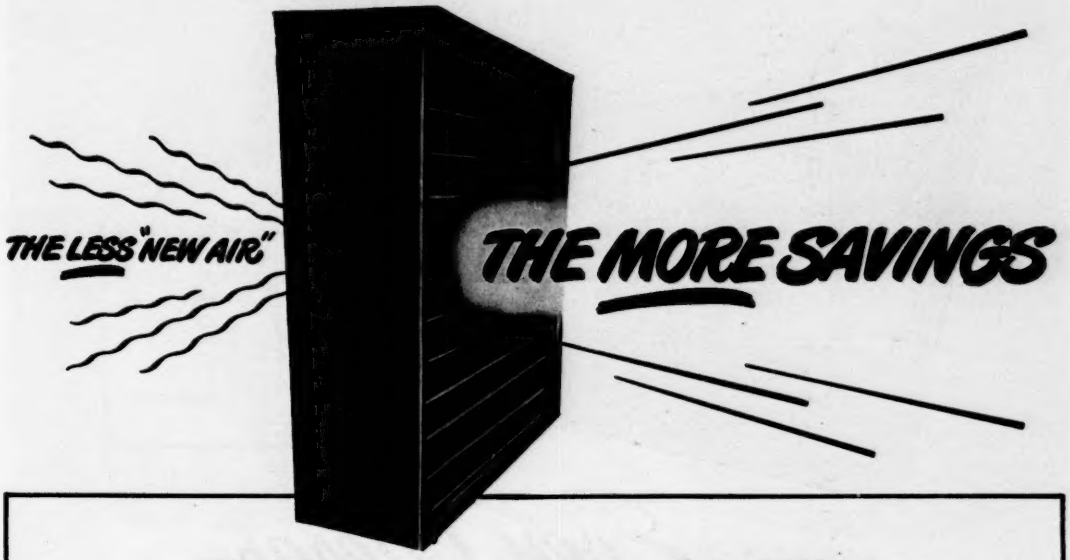
There's a New Carrier Weathermaker for every air conditioning job . . . Summer—Winter . . . large—small!

1000 to 16,400 cfm in single units

Wide range of capacities for every air conditioning load and function. Complete flexibility in arrangement of functional sections and components. New improved fan combines stable characteristic, efficiency, quietness. Roomy compactness with new fans and inclined coil saves space and weight. Designed for on-the-job accessibility, simplifying routine service and maintenance. Coil connections on either end simplify piping layouts. Rugged welded casing, proved sound over the years. Effective insulation prevents sweating, rubber paint retards rust. Built in the Carrier tradition of leadership for long life, dependable service. For information write Carrier Corporation, Syracuse 1, N. Y.

Carrier

AIR CONDITIONING • REFRIGERATION • INDUSTRIAL HEATING



OVER 6,000 USERS

Save Millions

WITH

DOREX AIR RECOVERY

With Dorex C Cells in an air conditioning system, the volume of new, outside air that must be taken in can be reduced by as much as two-thirds. Thus, cost of original equipment and operating costs are both materially lower.

These facts are of great importance to economy-minded industry today.

It costs over $200 a year to condition every thousand cubic feet of new air circulated per minute. But Dorex Air Recovery "manufactures" fresh air for less than half this cost. Dorex Air Recovery is backed by more than 20 years of experience . . . the biggest names in American business are Dorex users. With Dorex Air Recovery you have more to offer your clients.

Get the complete story of Dorex Air Recovery—technical details, actual savings made, list of users. Write today for Bulletin 117-C.

DOREX
Air Recovery

W. B. CONNOR ENGINEERING CORP.
Danbury, Connecticut

Air Diffusion • Air Purification • Air Recovery

In Canada: Douglas Engineering Co., Ltd.,
190 Murray Street, Montreal 3, P. Q.

W. B. CONNOR ENGINEERING CORP.
Dept. B-51, Danbury, Connecticut

Please send me, without obligation, full information on Dorex Air Recovery.

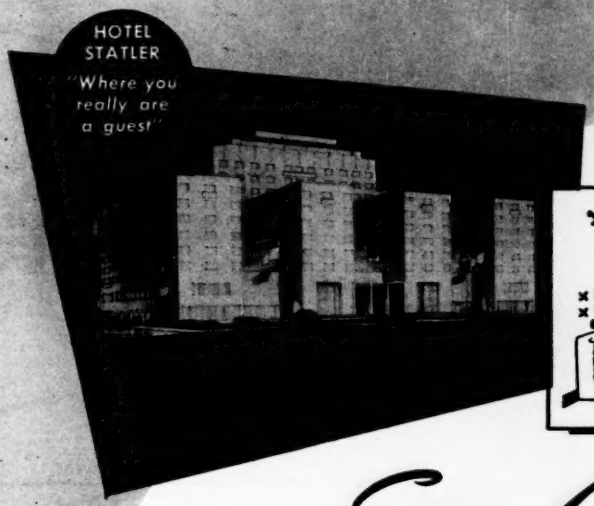
Name.....

Position.....

Company.....

Street.....

City..... Zone..... State.....



Even Caesar

would have cheered a bath like this...

THERE'S A REASON Next time you chuckle over one of these clever Statler cartoons in your favorite magazine, remember that there's a reason for the plentiful supply of hot water for the guest's bath:

SARCO TEMPERATURE REGULATORS

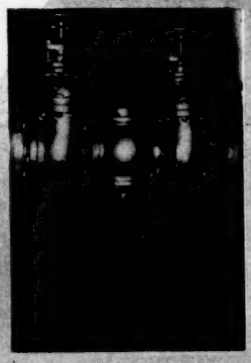
on all hot water heaters, as for example at this new Statler in Washington, D. C. These regulators include one 6", three 4" and one 3" Sarco Type TR-21.

For more than 25 years, Sarco self-operated Temperature Regulators have been used as standard equipment on storage type hot water generators.

For water always hot enough, never too hot, specify Sarco.

***New* bulletin No. 603 lists temperature controls for every type of water or oil heater.**

Sarco Type TR-21 self-operated Temperature Regulator with flanged valve. Liquid expansion provides the dependable operating force.



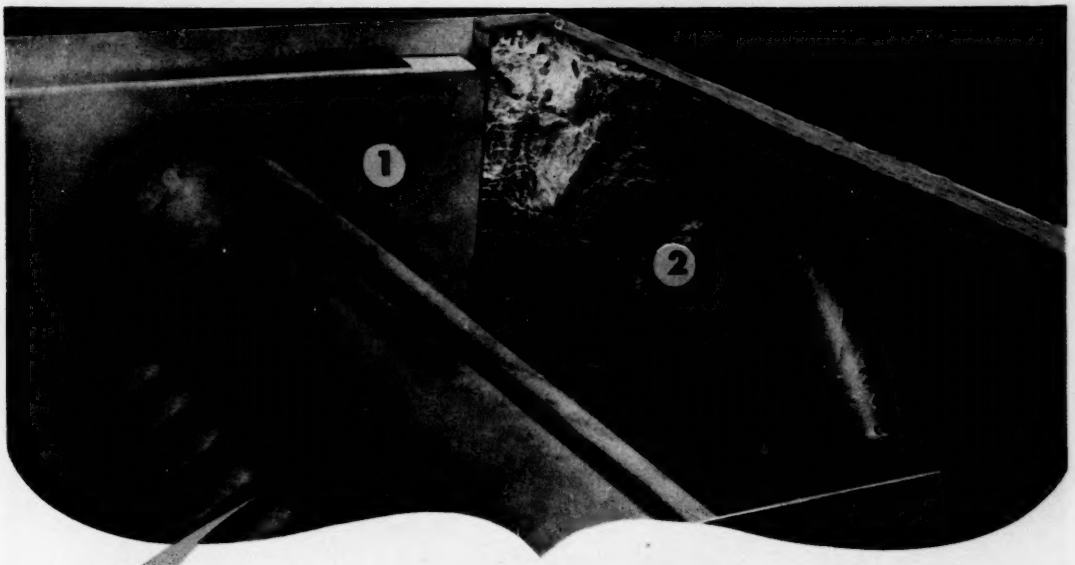
Front of a horizontal storage water heater in the Hotel Statler, Washington, D. C., showing the 4" Sarco Regulator installed thereon. All five water heaters are equipped with Sarco Temperature Regulators.

SARCO COMPANY, INC.

EMPIRE STATE BUILDING, NEW YORK 1, N.Y.
SARCO CANADA LTD., TORONTO 5, ONTARIO

REPRESENTED IN PRINCIPAL CITIES

336

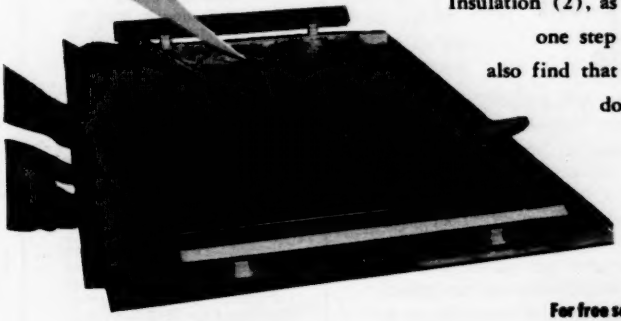


New furnace insulation method saves steel!

Foil-faced ULTRALITE Insulation replaces baffle plate; saves time and metal, keeps jackets cooler!

Now you can do a superior job of furnace insulation—and save precious steel in the bargain—by using Ultralite, the long, strong glass fiber insulation!

The new method, as practiced by leading furnace manufacturers, is simply this: Replace baffle plates (1) with blankets of Ultralite thermal and acoustical Heater Insulation (2), as shown in the photo above. By removing one step in your operations, you'll save time. You'll also find that Ultralite keeps jackets cooler and does a better job of deadening objectionable popping and crackling noises!



You can adhere Ultralite thermal and acoustical Heater Insulation to metal with adhesives alone; it is not necessary to use screws and washers. Ultralite's long, strong glass fibers are non-irritating, non-corrosive, fire-resistant, and as permanent as glass itself.

For free samples and catalog A.I.A. File No. 37-D-2, WRITE TODAY!

Please send me samples of ULTRALITE and catalog A.I.A. File No. 37-D-2. HV-3

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COMPANY_____

ADDRESS_____

CITY_____ STATE_____

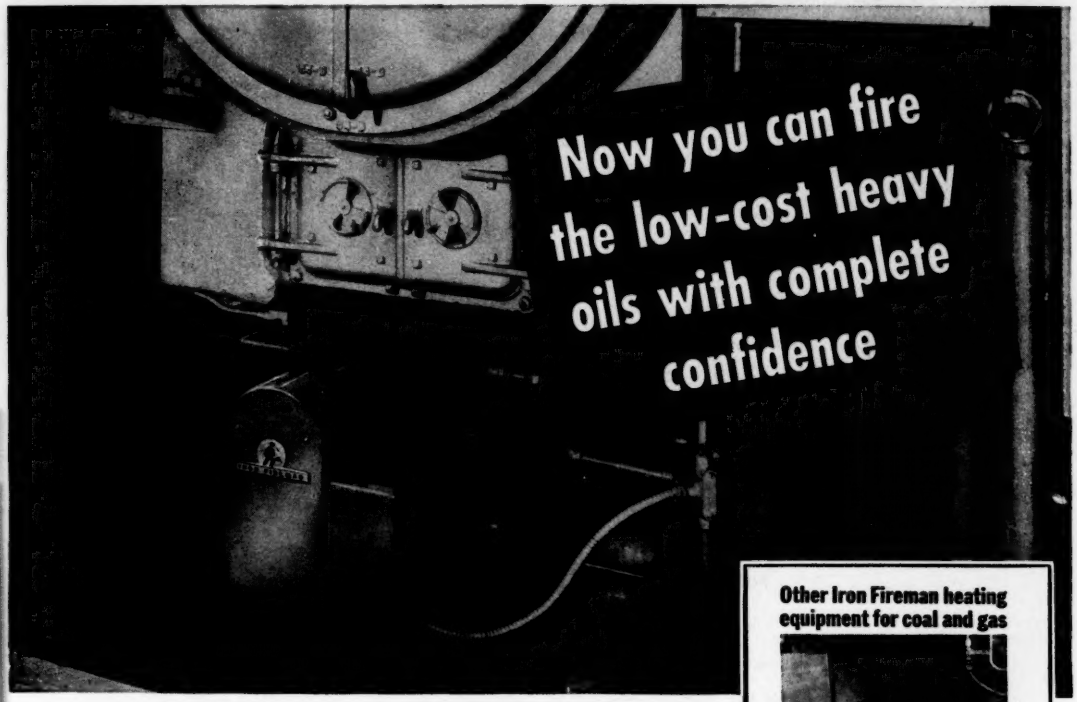
GUSTIN-BACON MANUFACTURING CO

GUSTIN-BACON MFG. CO.

1412 WEST 12TH ST., KANSAS CITY, MO.

New York Chicago Philadelphia San Francisco Los Angeles Houston Tulsa Ft. Worth

Cut Heating Costs



Iron Fireman Rotary Oil Burner fires economical heat-rich heavy oils (Nos. 5 and 6) with steady, uniform flame

The Iron Fireman Horizontal Rotary oil burner handles all grades of oil —from lightest to heaviest—with accuracy and precision. The Oil Volumeter meters the oil to the nozzle by *volume*—not by the old-fashioned methods of viscosity compensating valves or adjustable ports. This precision feed results in a steady, uniform flame, even when throttled down to less than 20% of capacity. Dependable oil flow results in thorough reliability, even when starting up in a cold boiler.

The heavy fuel oils (Nos. 5 and 6) are lower priced than ordinary burner oils, yet they may contain up to 12% more Btu's per gallon, as compared with lighter oils. Thus, with the precision firing of these heavy oils you save in two ways —in the cost per gallon and the amount of heat obtained per gallon.

For further information write for new illustrated 16-page booklet, "The Iron Fireman Horizontal Rotary Oil Burner."

Other Iron Fireman heating equipment for coal and gas

Coal-Flow Stoker
Feeds coal directly from bin to fire. Capacity from 30 to 400 boiler horsepower.

Pneumatic Spreader Stoker
Easily adaptable to all boiler room layouts. Fires all grades of coal efficiently, including sub-bituminous and lignite. Capacities to 1000 boiler h.p.

Commercial Gas Burners
Efficient, dependable, labor-saving. Easily installed. Capacities to 400 boiler h. p.

Write for folders on any of this outstanding industrial equipment

IRON FIREMAN
MANUFACTURING COMPANY
3160 WEST 106TH STREET CLEVELAND, OHIO

Here's a *Space-Saving* air distribution system

using
kno·draft
type HPC high pressure
air diffusers

Kaufmann's Department Store, Pittsburgh, Pa., uses 3,500 Kno-Draft HPC Air Diffusers. Units are installed 7 feet apart on 7″ x 14″ ducts, which are located 20 feet apart and mounted about 9 feet from the floor. In spite of the small, space-saving ductwork, thorough, draftless distribution of air is obtained.

Kno-Draft Type HPC High Pressure Air Diffusers are brand-new in principle, but already *proved* in service. Operating at high pressure and velocity, they provide draftless distribution of air to large open areas but require only small, uniform, exposed ducts. As developed for Kaufmann's Department Store in Pittsburgh, the Kno-Draft Type HPC High Pressure Air Diffuser—

1. **Saves** space; uses small, uniform exposed ducts.
2. **Operates** at high pressure and velocity —allows 3000 fpm velocities and 2″ static pressure in ducts.
3. **Achieves** high air induction, draftless distribution—primary air 25° colder than room air.
4. **Provides** complete adjustability to any volume between 90 and 180 cfm, or may be totally shut off.
5. **Functions** perfectly in department store and general office applications.

A new type perforated damper, combined with an interior baffle and jet exit, permits the high pressures and velocities necessary. For a detailed description of the new Kno-Draft Type HPC Air Diffuser—how it works and its application possibilities—mail the coupon today.

TRADE MARK "KNO-DRAFT" REG. U. S. PAT. OFF.

W. B. CONNOR ENGINEERING CORP.
Danbury, Connecticut
Air Diffusion • Air Purification • Air Recovery
In Canada: Douglas Engineering Co., Ltd., 190 Murray Street, Montreal 3, P. Q.

W. B. CONNOR ENGINEERING CORP.
Dept. J-31, Danbury, Connecticut

Please send me, without obligation, Bulletin K-26, which provides full information on the NEW TYPE HPC Kno-Draft Air Diffuser.

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Position.....
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Street.....
City..... **Zone** ..... **State**.....

Good workmen + good tools + GOOD PIPE = GOOD JOB!

7 POINTS OF UNIFORM GOODNESS IN YOUNGSTOWN STEEL PIPE

- uniform ductility
- uniform lengths
- uniform threading
- uniform weldability
- uniform wall thickness and size
- uniform strength and toughness
- uniform roundness and straightness

ON the job or in the shop, you like to work with Youngstown pipe. Cutting is clean, fast and easy because Youngstown pipe is uniformly round and soft--true to size, even in grain structure, free of inclusions and hard spots. The name Youngstown, rolled into every length, means GOOD PIPE.

QUALITY V YOUNGSTOWN SERVICE

Youngstown STEEL PIPE

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steel

General Offices — Youngstown 1, Ohio

Export Office - 500 Fifth Avenue, New York

PIPE AND TUBULAR PRODUCTS - WIRE - ELECTROLYTIC TIN PLATE - COKE TIN PLATE - HOT AND COLD FINISHED CARBON AND ALLOY BARS - RODS - SHEETS - PLATES - CONDUIT - RAILROAD TRACK SPIKES.

ADJUSTABLE PIPE HANGERS AND SUPPORTS

for every piping requirement

I-Beam Clamp
fig. 131
for 2 to 6-in. flange

Center I-Beam Clamp
fig. 217
safe load: 150 lb

Simplex Top Beam Clamp
fig. 267 — safe load: 150 to 2300 lb

Swinging Top Beam Clamp
fig. 270 — safe load: 150 to 2300 lb

Universal Channel Clamp
fig. 226 — safe load: 150 to 2300 lb

Channel Extension Clamp
fig. 219
safe load: 150 lb

Simplex Channel Clamp
fig. 266 — safe load: 150 to 2300 lb

Universal Side I-Beam Clamp
fig. 225 — safe load: 150 to 2300 lb

Simplex Side I-Beam Clamp
fig. 265 — safe load: 150 to 2300 lb

C-Clamp
fig. 88
⅜ to ¾ -in. rod.

UFS W-F I-Beam Clamp With Links and Weldless Eye Nut — fig. 293
safe loads: up to 11,500 lb

UFS I-Beam Clamp with Weldless Eye Nut
fig. 292 — safe loads: up to 11,500 lb

UFS W-F I-Beam Clamp With Links
fig. 294 — safe loads: up to 11,500 lb

UFS I-Beam Clamp
fig. 228 — safe loads: up to 11,500 lb

C-B Universal Concrete Insert
fig. 282
⅜ to ⅞-in. rod

C-B Junior Concrete Insert
fig. 279
⅜ to ⅝-in. rod

Screw Concrete Insert
fig. 151
⅜ to ⅞-in. rod

Expansion Case Closed Back Type
fig. 117
¼ to 1-in. rod

Write for Hanger Catalog 10D

GRINNELL

WHENEVER PIPING IS INVOLVED

GRINNELL COMPANY, INC., Providence, R. I. Warehouses: Atlanta • Billings • Buffalo • Charlotte • Chicago
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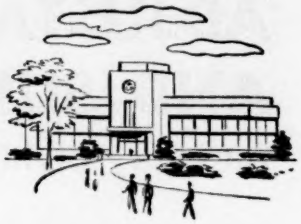
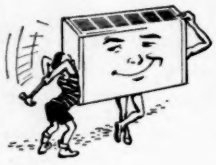
Modine Institutional Convectors Assure

Uniform Floor-to-Floor Temperatures
Economical, Trouble-Free Heating



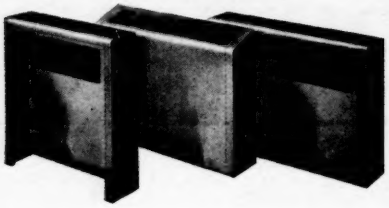


YOUNGSTER-PROOF — Modine Institutional Convectors are built to stand up under the hardest treatment. They're formed of heavy-gauge metal — sturdily reinforced.

LOCK-TYPE FRONTS — operated by a special wrench, furnished at no extra cost. For Convectors equipped with dampers, lock-type damper controls also available.

MODINE Convectors provide fast, *uniform* heating, even in the coldest weather — permit you to take full advantage of the benefits offered by steam or hot water heating. They are ideal for school room installation because they cannot burn hands or clothing, even on direct contact. Their smart, unobtrusive styling makes them first choice with top architects and designers.

Modines are light and easy to install. Initial cost is surprisingly low — and extra years of trouble-free service are an important Modine plus.

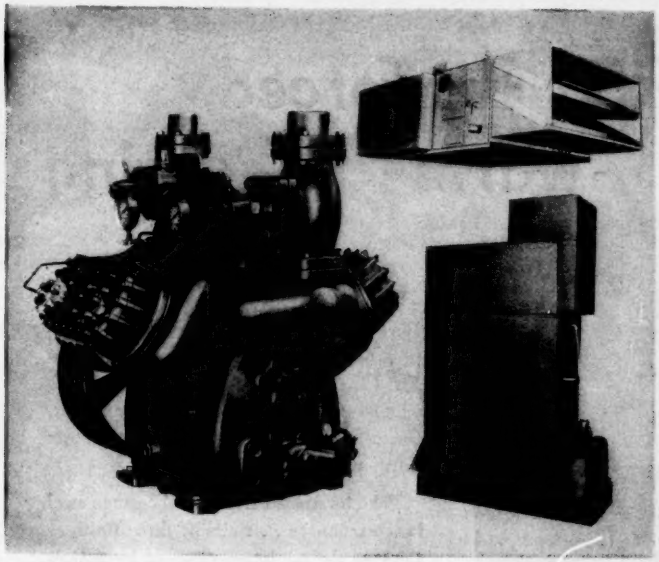


Choose from three enclosure types. *Type IF* with upper grille and choice of lower opening or lower grille . . . for either recessed or free-standing installation. *Type IW and IS* designed for wall placement. Dampers for all enclosures optional at slight extra cost.

Modine
INSTITUTIONAL CONVECTORS

For full details, call your Modine representative . . . listed in the "Where-to-buy-it" section of your phone book. Or write direct. Modine Mfg. Co., 1511 Dekoven Ave., Racine, Wis.

R-1098



Who Makes a COMPLETE Freon Reciprocating System?

A completely integrated and balanced system—all *manufactured*, not just assembled, by the *one* manufacturer—that's Worthington.

No other company makes a wider variety of complete Freon reciprocating systems.

No other company offers more perfectly balanced operation of inter-related components—for lowest costs, longest life.

Worthington Freon-12 Compressors and Refrigeration Units. One basic compressor design covers a size range from 2 to 125 tons, with three cylinder sizes. Simplified construction. Lightweight automotive pistons. Worthington Feather* Valves—simplest, lightest, quietest ever made. Internal manifold. Renewable cylinder liners and leakproof, continually-cleanable force-feed lubrication in larger sizes. Positive manual or automatic capacity control. Available in self-contained compressor-condenser units.

Worthington Air-Handling Units. Perform complete air conditioning functions. Water cooling or direct expansion. Five sizes: 4 to 60 tons, 4000 to 13,500 cfm. Horizontal or vertical. Sectional design.

Worthington Evaporative Condensers. All parts exposed to moisture made of zinc-coated steel, bonderized and coated with rubber-base enamel containing special rust inhibitor. Prime surface—no fins to clog. Staggered coils permit air deflection and complete wetting. Six sizes from 2000 to 27,000 cfm.

Also: *Worthington Evaporative Coolers* in same range.

*Reg. U. S. Pat. Off.

Bulletins containing complete information are available

First Completely Air-Conditioned Apartment House in New England

Beacon Towers Apartments, Brookline, Mass. is the first building of its type in New England to be 100% air-conditioned.

E. A. Berman Company of Boston, under the direction of M. L. Cail, installed a three-zone cooling water system for the 34 apartments. Individual room units are served by a refrigeration unit consisting of a Worthington Freon-12 compressor, evaporative condenser and water chiller.

The system is designed and operated for automatic heating in winter and cooling in summer.

Experience of the owners has been that the air conditioning helped to lease the apartments for 3-year periods.

Laboratory Air Conditioning Duplicates Mill Conditions

Worthington also manufactures a complete line of *centrifugal* refrigeration.

When the W. Harrison Hightower Textile Engineering Building was built at the Georgia Institute of Technology, Atlanta, to house its textile school, Worthington refrigeration for air conditioning was installed to provide the proper temperature and relative humidity required for textile processing.

Fourteen separate rooms are individually air-conditioned, through a chilled water system, from a 150-ton Worthington centrifugal refrigeration system, electrically-driven. This machine is equipped to shut off automatically in the event of trouble anywhere in the system.

Installed by Engineering Contractors, Atlanta, Ga.

WORTHINGTON

AIR CONDITIONING AND REFRIGERATION

INVESTIGATE

MORE WORTH WITH WORTHINGTON

Consult Classified Telephone Directory for nearest Worthington distributor. Worthington Pump and Machinery Corporation, Air Conditioning and Refrigeration Division, Harrison, N. J., specialists in air conditioning and refrigeration for more than 50 years. A.1.1

FIRST for forced warm-air heating

Bryant Model BA-87 Gas-Fired Forced Warm-Air Furnace. For all gases. A.G.A. inputs from 60,000 to 375,000 Btu per hour.

Here's one of the stars of the heating industry! Feature for feature, this Bryant Gas-Fired Forced Warm-Air Furnace offers advantages of design, construction and performance that are unsurpassed in any other warm-air unit.

Take its rugged *Hevigage* 12-gauge steel heat exchanger . . . almost three times as thick as the minimum required by A.G.A. and designed to provide the most rapid and efficient heat transfer. Take the brilliantly engineered Bryant Automatic Pilot and Controls, with their long record for reliability and gas-thrifty operation.

Run down the complete list of Bryant features in this popular unit and you'll decide it's the one you can count on for quick, easy, trouble-free and *profitable* installation!

The Bryant Distributor near you will welcome an opportunity to tell you the whole story. Contact him today, or write direct to Bryant Heater Division, Dept. 162, Affiliated Gas Equipment, Inc., 17825 St. Clair Avenue, Cleveland 10, Ohio.

Let the pup be furnace man ...and water boy too!

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AUTOMATIC HEATING

Your *single source* of supply for everything in gas heating equipment!

American Blower—a time-honored name in air handling

Venturafin Unit Heaters

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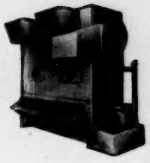
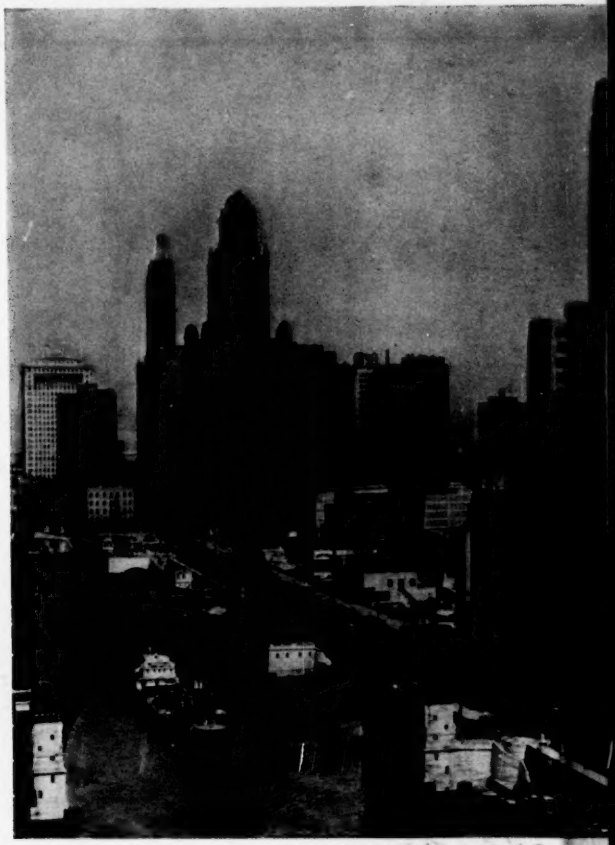


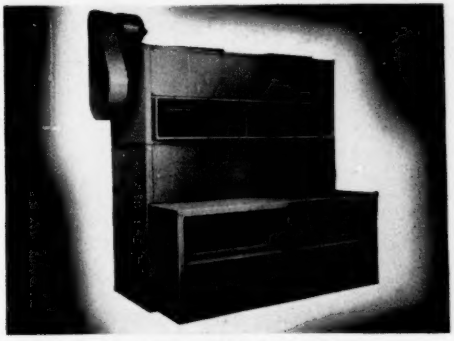
Air Conditioning Equipment



Look before you buy and you'll buy American Blower products. All air handling equipment is not alike. There's a big difference in quality, design, and quietness, as well as in operating costs and efficiency. The superiority of American Blower products has been proved in test after test by buyers.

In Chicago, as in other cities, American Blower Air Handling Products have been serving commerce, industry and public utilities for over half a century. For air handling data in the Chicago area, call American Blower — FINANCIAL 6-2531. In other areas, consult your phone book.

Product of the month



American Blower Type A Conditioner. Capacities from 1000 to 13,600 cfm.

Control the weather in your business!

American Blower Air Conditioning units are designed for summer cooling and dehumidifying and winter heating and humidifying.

This dual function by the same piece of equipment results in substantial savings in cost and offers much in comfort.

Three types are available: the Type A Conditioner for normal unitary type commercial and industrial applications, the Type S Conditioner for unitary type application where washed air is desired or where high relative humidities are required, the Type M Conditioner for central system installation using duct systems. The Type M is ideally suited for industrial process applications where high air resistance makes the unitary type impractical.

For data, consult the nearest American Blower Branch Office.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary corporation

YOUR BEST BUY AMERICAN BLOWER AIR HANDLING EQUIPMENT

Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

THIS FREE SERVICE CAN HELP SLASH YOUR FUEL OPERATING COSTS

Anthracite Institute offers building management and management engineers and property owners this free complete heating survey regardless of the kind of fuel used.

Without cost or obligation an experienced, accredited combustion engineer will be glad to make an inspection of your heating plant. As part of the survey, he will provide you with an engineering analysis which covers the size and type of fuel which your plant should or could burn for maximum efficiency. He will check present controls; he will survey the over-all condition of the boiler and check firing methods. He will check air elimination and combustion efficiency by flue gas analysis.

Following this comprehensive engineering analysis, he will submit a detailed report to you or your agent. Included with the report will be the benefit of his personal counsel if it is wanted. **There will be no charge for any part of this service.**

Smoke Control

Smoke is an indication of wasted fuel. If you have trouble with smoke, this analysis will be of particular value because as part of this over-all survey, we will study your smoke problem. The analysis and following report will show you the quickest and most economical way to reduce your fuel bill. All methods will be studied including the advisability of changes in present firing methods, the installation of mechanical firing and possible changes in size or mixtures of fuels.

Here's a typical testimonial from one satisfied user on the value of this service

"We wish to thank you for the 8 reports which you sent us covering the maintenance and operation of the steam plants in those buildings. We intend to carry out most of your recommendations and are confident that it will help us to reduce the fuel costs in these buildings. Several of the recommendations are items which had never been called to our attention before and will be helpful . . . in improving the efficiency of the plants in other buildings which you did not inspect."

. . .

This engineering analysis of your heating system is available to you without cost or obligation. To obtain it just phone MUrray Hill 9-6890 or write today to Anthracite Institute, 101 Park Avenue, New York 17, New York.

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Before you build... before you modernize

SEE HOW G. E. CAN HELP YOU CUT AIR CONDITIONING COSTS

Personal Weather Control
AIR CONDITIONING SYSTEMS

The adaptability and equipment advantages of G-E Personal Weather Control Air Conditioning produce important savings in multi-room buildings of all kinds

Air conditioning that satisfies both building requirements and tenant desires...and yet is often substantially lower in cost than other systems—that's what you get with General Electric Personal Weather Control. Designed to supply year 'round comfort in office buildings, hospitals, hotels, apartment houses, and other multi-room structures, these newly-improved G-E Systems feature unparalleled flexibility.

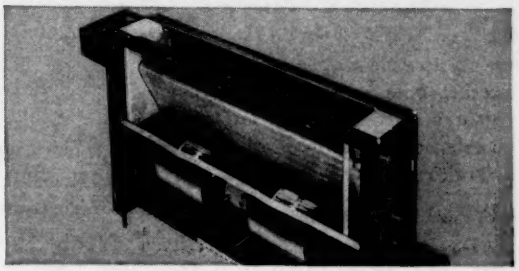
Building owners like the way G-E Systems can be quickly adapted to office rearrangement. Architects and engineers like the saving in space that is often possible because G-E Systems can be installed with small-size, high-pressure ducts or even without ducts. Tenants enjoy living and working in G. E.-air-conditioned buildings because they get individual room control of climate.

Here are a few of the ways you save!

LOWER INSTALLED COST! G-E Personal Weather Control Systems using the individual G-E Room Air Conditioner shown above often require substantially lower compressor capacity than competing systems. Application with small-size, space-saving ducts, or without ducts at all, can save both installation and building costs.

LOWER OPERATING COST! Since G-E Systems often require less compressor capacity, there's a saving in power cost too! Room units in unoccupied rooms can be shut off. When load conditions are reduced, units can be operated without running ventilation equipment. And G. E.'s filters help coils maintain top efficiency.

LOWER MAINTENANCE COST! All air—both room and ventilation—is filtered, protecting coils from dust and dirt which have been known to cut efficiency up to 15%. Simple, inexpensive filter replacement takes less than a minute. No costly coil cleaning.



LOWER REPLACEMENT COST! Attractive, rugged G-E Air Conditioners give top performance year after year. "Never had to replace one," says Clay J. Berry, The Fair Bldg., Fort Worth, where a 500-unit General Electric System was installed in 1939.

You can put your confidence in—

GENERAL ELECTRIC

General Electric Company, Air Conditioning Dept., Sec. HV-4, Bloomfield, New Jersey
Please send me, without obligation, detailed information on G-E Personal Weather Control Air Conditioning Systems.

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COMPANY.....

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CITY.....STATE.....

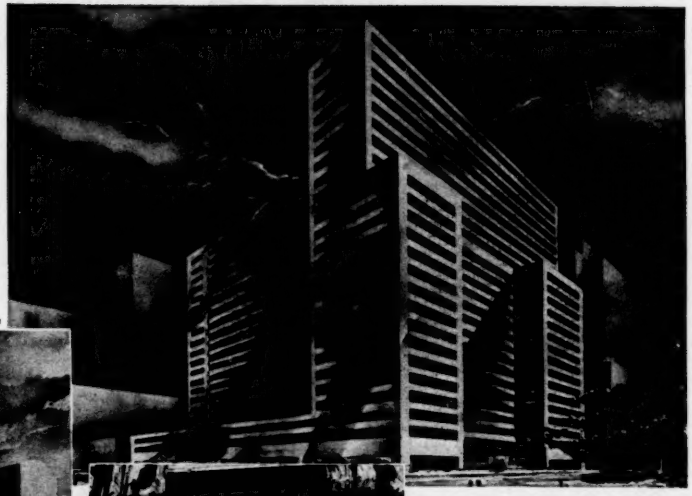
Another York-Sized Job

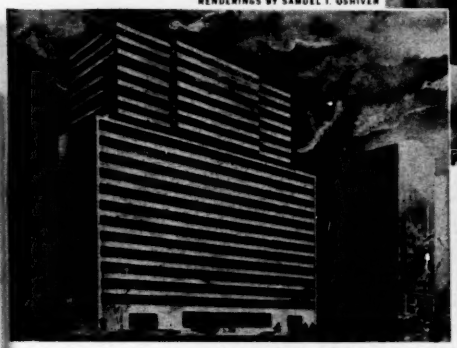
World's first fully air conditioned skyscraper apartment houses

Philadelphia's ultra modern cliff dwellings— the 25-story Rittenhouse Claridge and 20-story Rittenhouse Savoy—reach new highs in 100% air conditioned multiple housing.

As so often happens when York helps out on the tall, tough jobs in air conditioning, the architects and engineers are missing many a headache.

RENDERINGS BY SAMUEL I. OSHIVER





York Fan Window Unit. "Open" view shows Tri-motor Impeller.

Sponsor: Matthew H. McCloskey, Jr. and Kevy K. Kaiserman
Architect: Oshiver, Knopf and Fieldstein • Consulting Engineer: Leslie S. Tarleton
Builder: McCloskey & Co. • Mechanical Contractor: Ambrose-Augusterfer Corp.

York's years-ahead techniques are effecting installation and operating economies . . . and making each tenant a weather czar in his own domain, not the dependent of a fixed and centralized air supply.

York's new Fan Window Unit above, gives each room its own on-the-spot weather laboratory. Individually equipped to take in fresh air and circulate it—curried and cleaned to mountaintop freshness—at any rate of supply the dweller desires. Filters recirculated air . . . another York plus over centralized-air-system units.

The only central supply system is water, chilled for cooling and dehumidifying in summer and warmed for winter heating, piped to the Fan Window Units.

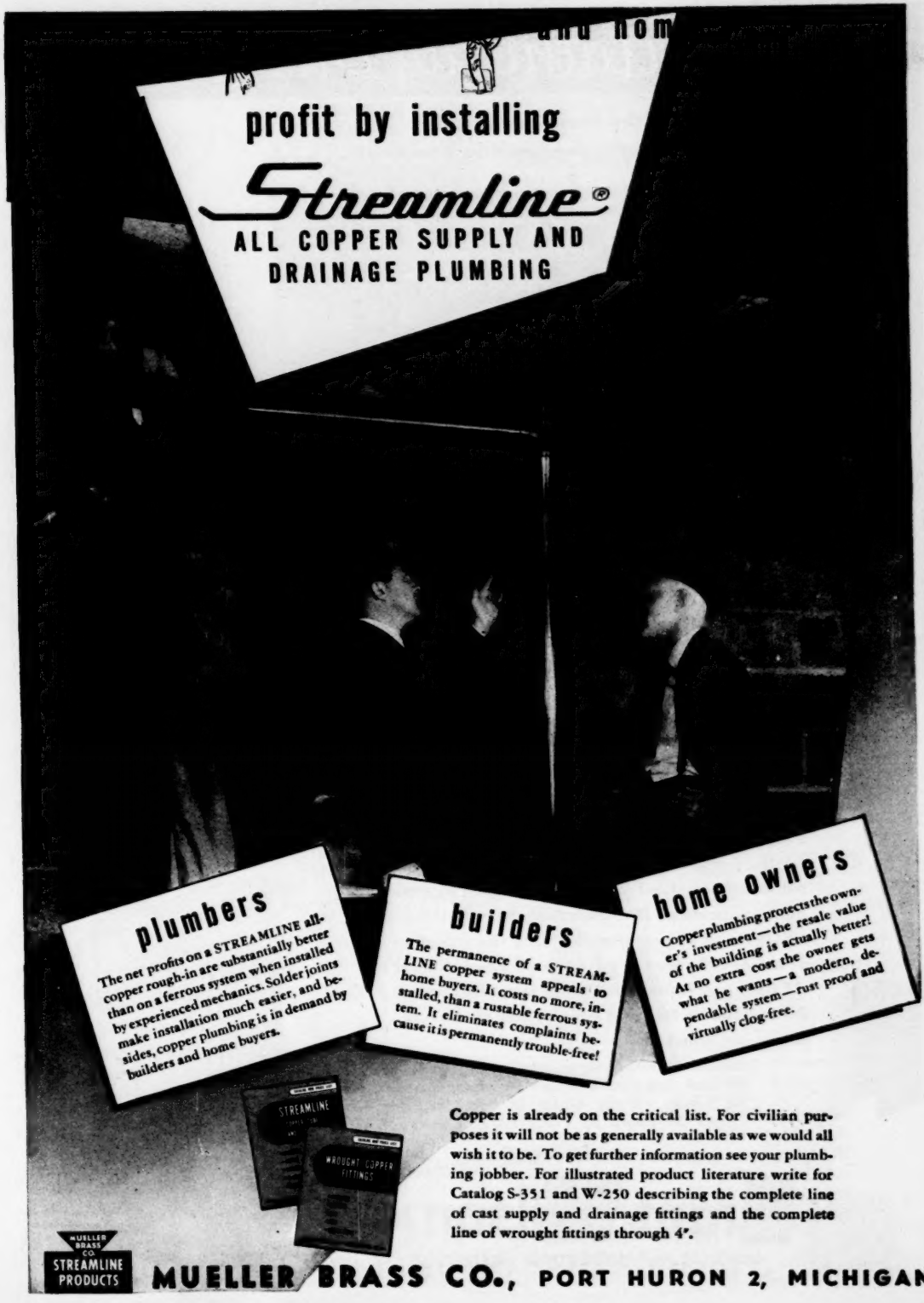
With no bulky air ducts to honeycomb the building—with no air handling equipment to eat up engine room space—the structural, architectural and economic advantages are very obvious.

UNLOAD THE HEADACHES AND DETAIL of your air conditioning problems. Come to York . . . where the science came of age—where the important advances are pioneered. Protect your clients with the York Certified Maintenance Plan. Check your York consultant—see classified directory. *Or write* York Corporation, York, Pa.

York refrigeration and air conditioning

The big advances come from YORK

Headquarters for— **Refrigeration and Air Conditioning**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Streamline®
ALL COPPER SUPPLY AND DRAINAGE PLUMBING
plumbers
The net profits on a STREAMLINE all-copper rough-in are substantially better than on a ferrous system when installed by experienced mechanics. Solder joints make installation much easier, and besides, copper plumbing is in demand by builders and home buyers.
builders
The permanence of a STREAMLINE copper system appeals to home buyers. It costs no more, installed, than a rustable ferrous system. It eliminates complaints because it is permanently trouble-free!
home owners
Copper plumbing protects the owner's investment—the resale value of the building is actually better! At no extra cost the owner gets what he wants—a modern, dependable system—rust proof and virtually clog-free.
STREAMLINE
WROUGHT COPPER FITTINGS
MUELLER BRASS CO. STREAMLINE PRODUCTS
Copper is already on the critical list. For civilian purposes it will not be as generally available as we would all wish it to be. To get further information see your plumbing jobber. For illustrated product literature write for Catalog S-351 and W-250 describing the complete line of cast supply and drainage fittings and the complete line of wrought fittings through 4".
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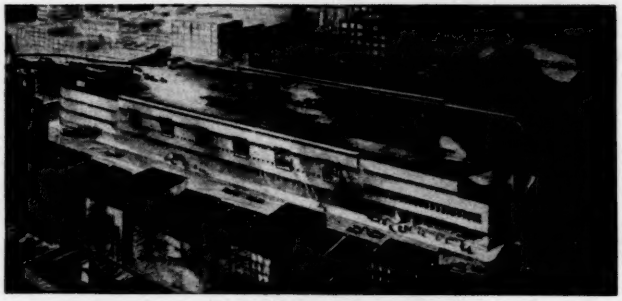
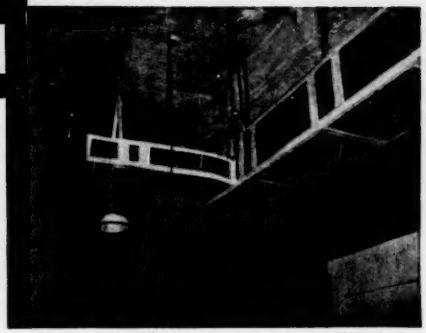
...the Port Authority Bus Terminal

representing the most advanced architectural and engineering practices . . . . .



Grant Wilson DUX-SULATION



the "engineered" duct insulation that insures less temperature loss between source and outlet

***Dux-Sulation is just as practical for a small heating or air conditioning installation as it is for the world's largest Terminal shown above. A thermal/acoustical insulation designed expressly for duct application, Dux-Sulation steps up the overall efficiency of any system involving the transfer or travel of heated or refrigerated air. K Factor is .27 BTU and sound absorption is approximately 61%. Installation is fast and simple, and insulating values are constant.**

Inspect Dux-Sulation yourself. A handy sample kit and complete engineering data is yours for the asking. Write Grant Wilson, Inc., for Kit 533-HV to Board of Trade Bldg., Chicago 4, Ill.

Photo of duct section in new terminal insulated with Grant Wilson Dux-Sulation.

Grant Wilson inc.

ASBESTOS and INSULATING MATERIALS

Announcing!

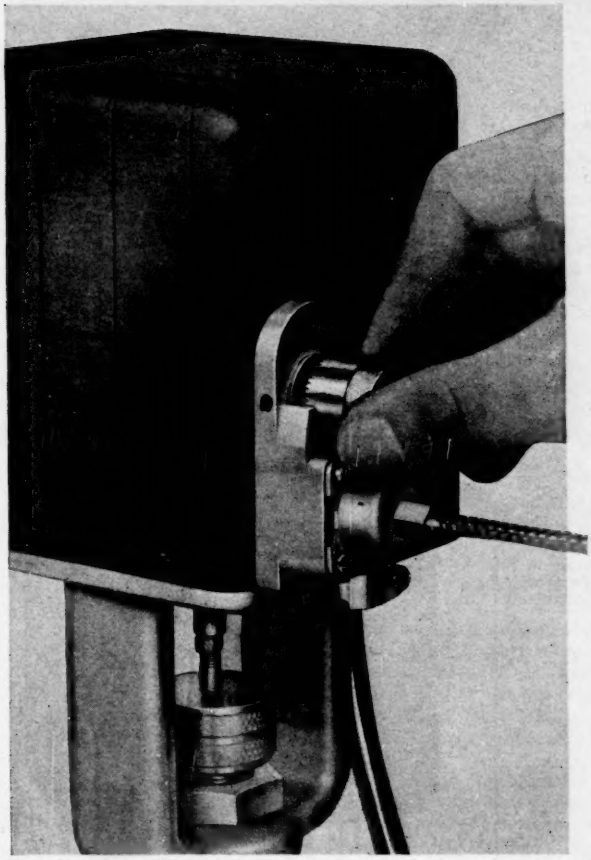
BARBER COLMAN

the new

self-contained electrically operated TEMPERATURE REGULATORS

Featuring!

CALIBRATED dials



TWO MODELS— Standard Sizes

Model ADFE for 1/2" to 2" pipes (6 sizes). Standard electric motor-operator. Positive *motor-driven* power operator closes valve *tightly*. Tight-closing ability does not diminish with time. Delivered completely assembled, ready for installation. Temperature range, choice of 50°-130° or 120°-200°F. with calibrated dial.

Model FYBE for 3/4" to 4" pipes (8 sizes). Has heavy-duty motor-operator for installations involving higher pressures and larger capacities. Other features same as Model ADFE, including same choice of temperature ranges. Both models connect direct to 60-cycle A.C., 115 or 230-volt as specified.

for HOT WATER STORAGE TANKS
BOTTLE WASHERS
BATCH KETTLES
and other two-position on-off applications

Write for Literature
Ask for Bulletin F-4695

BARBER-COLMAN COMPANY
1224 ROCK STREET • ROCKFORD, ILLINOIS

BARBER COLMAN

IF IT'S CUSTOMERS YOU WANT

...then start now and install

BRUNNER SINCE 1906 AIR CONDITIONING

Last year we increased our production schedules on Brunner Self Contained Air Conditioners three times—*demand was triple that for which we had planned.*

This more than anything else we can tell you, proves that in a highly competitive market, Brunner units offered more of what the buyers wanted.

When a prospect asks what you have to offer it's a mighty satisfying feeling to say "Brunner," then proceed to show him design features that even a layman can understand will deliver air conditioning values which more than justify the investment.

There is no reason why you should sell the hard way—sell BRUNNER. It costs nothing to listen so use the coupon to make a date.

BRUNNER MANUFACTURING COMPANY
Utica 1, New York, U. S. A.

Tear out and Mail!

I'm willing to do more business. Have your factory field representative stop in and bring me up-to-date on what Brunner has to offer me as a dealer. Send current catalogs in the meantime.

Name _____

Company _____

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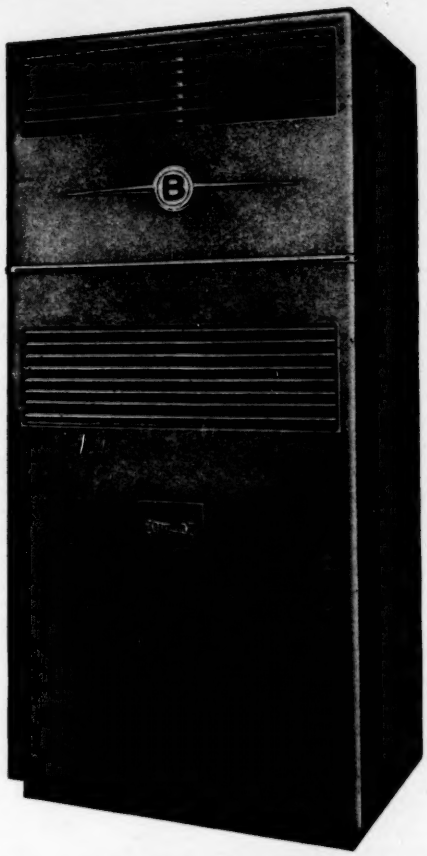
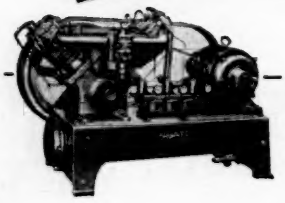


BRUNNER SINCE 1906

AIR CONDITIONING

- **Self Contained 3 HP. to 10 HP.**
- **Remote Type 3 HP. to 75 HP.**



Completely Brunner built . . . backed by a fine reputation forty-five years old.

REFRIGERATION CONDENSING UNITS by
AIR AND WATER COOLED MODELS—*a size and type for every purpose...*¼ **HP. TO 75 HP.**

BRUNNER SINCE 1906

"Aw shucks, he has **snow melting**"

Steel pipe is first choice for snow melting

A boy, a dog and a snow shovel are an irresistible combination for loosening heartstrings as well as purse-strings! The first snow brings the tinkling of the doorbell and the piping query, "Want your snow shoveled, mister?" Often a shy companion lurks just out of vision, hoping to share this first youthful adventure in capitalism.

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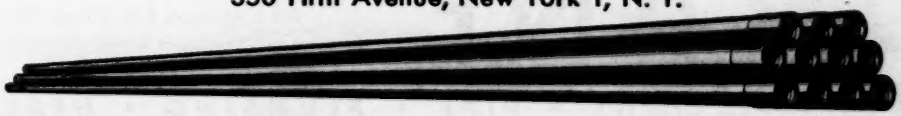

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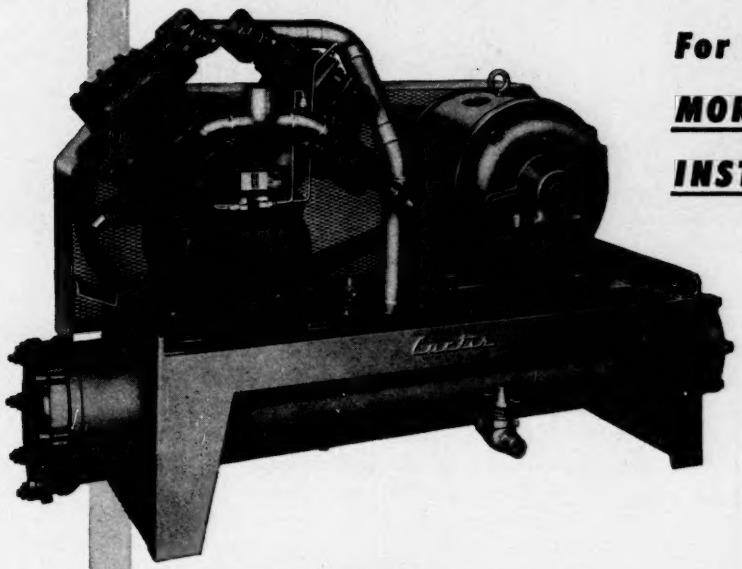

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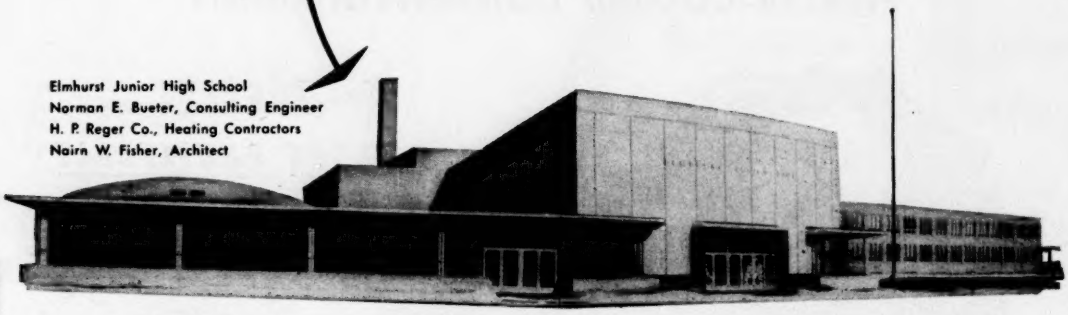
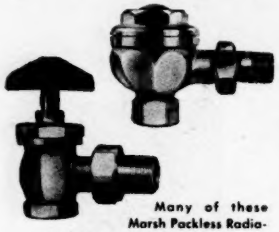
What equipment but MARSH ...for a model school building like this?

Elmhurst Junior High School
Norman E. Bueter, Consulting Engineer
H. P. Reger Co., Heating Contractors
Nairn W. Fisher, Architect





Many of these Marsh Packless Radiator Valves were used in the elaborate heating system of the Elmhurst Junior High, and a large number of thermostatic traps were used in connection with radiators and coils.

The Marsh No. 8 float and thermostatic trap, illustrated, is typical of many traps of this kind used in the Elmhurst school.

BIG SAVINGS WITH MARSH—TRITROL—heat regulation in step with the weather

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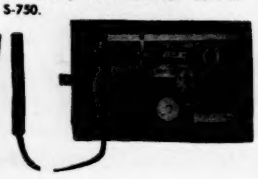

A lucky throng of boys and girls have just begun classes in the newly completed Junior High School at Elmhurst, Ill., a suburb of Chicago. One of the finest junior high schools ever built, the expansive structure houses a large gymnasium, a totally separate auditorium seating 900, a large, pleasant cafeteria, spacious well-equipped classrooms—facilities far beyond those of the old-time schools their dads and mothers knew as full fledged high schools.

In the rapid advance of school buildings during recent years, no phase has seen greater improvement than heating and air conditioning, and this model school is a particularly good example of this. No expense has been spared in any detail of the vacuum system to make it functionally and permanently effective. So it is significant that Marsh Traps and Valves were chosen for the vital job of keeping heating coils, mains and risers free from air and condensate throughout the entire heating system.

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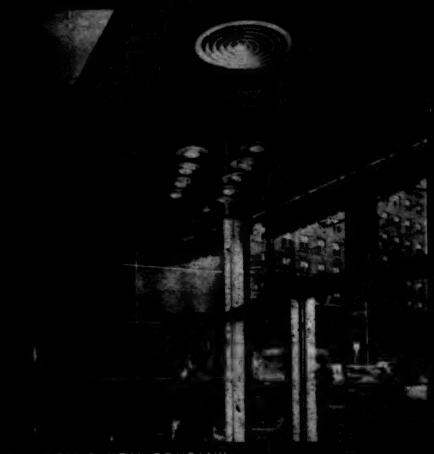

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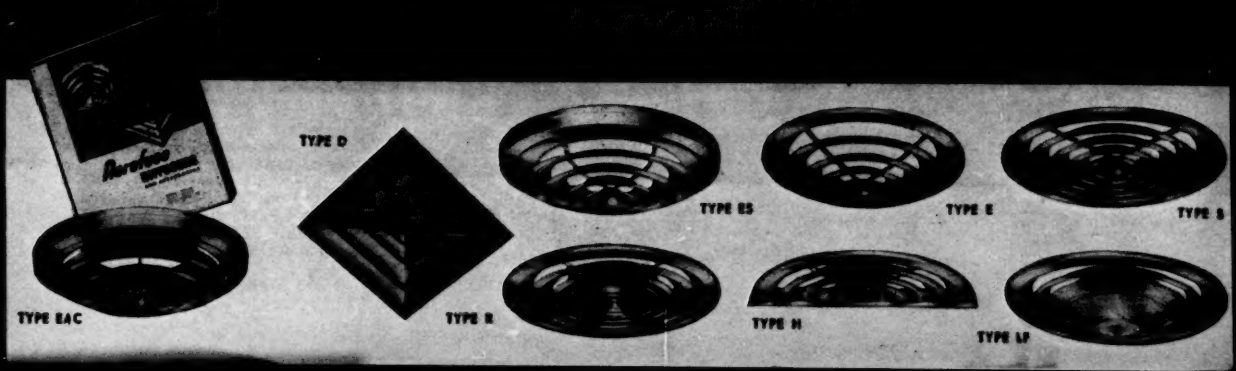

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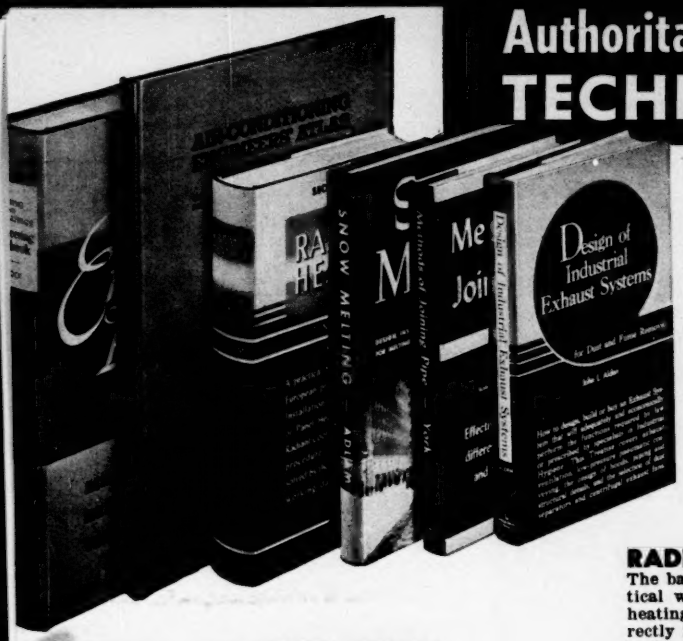

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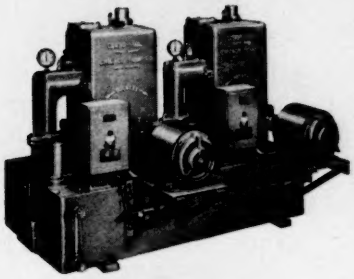
For Every Heating Service In All Types of Buildings



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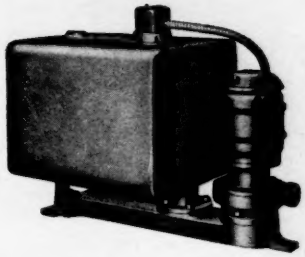

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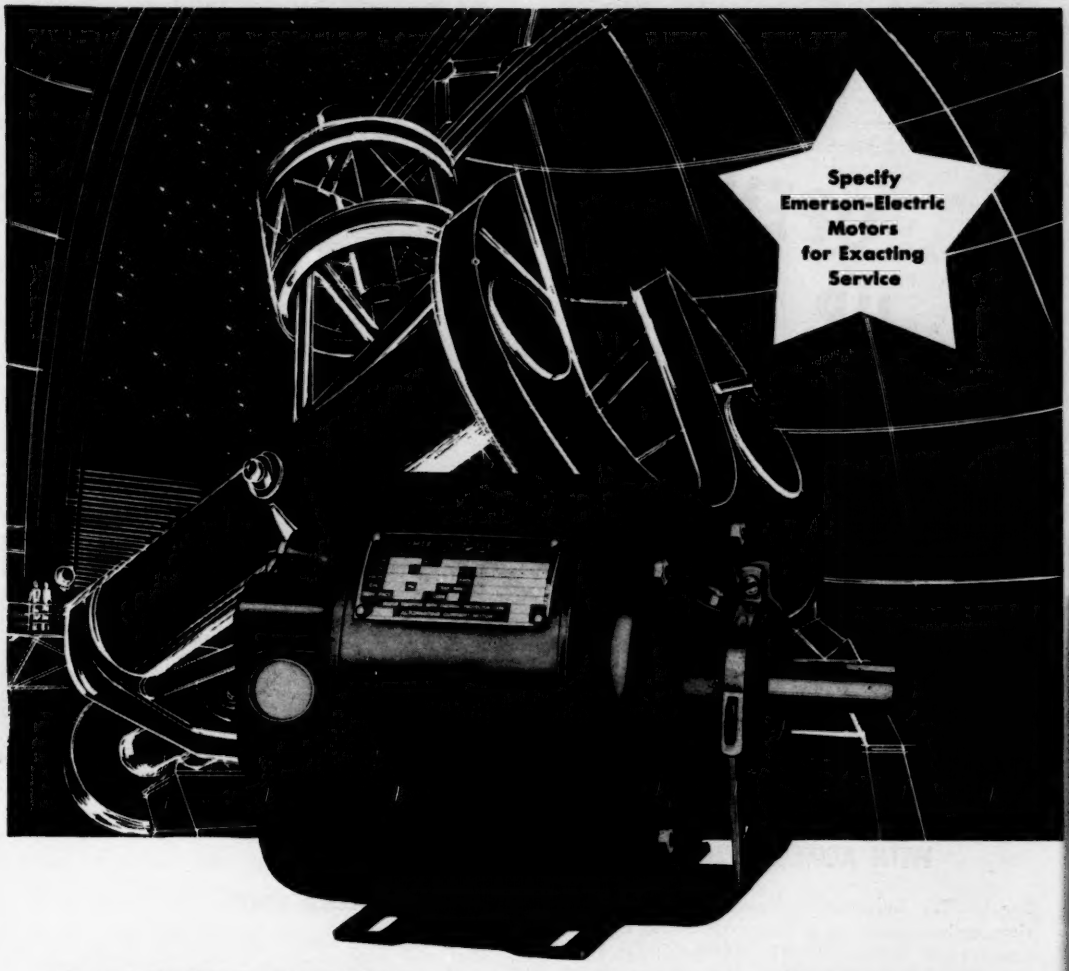

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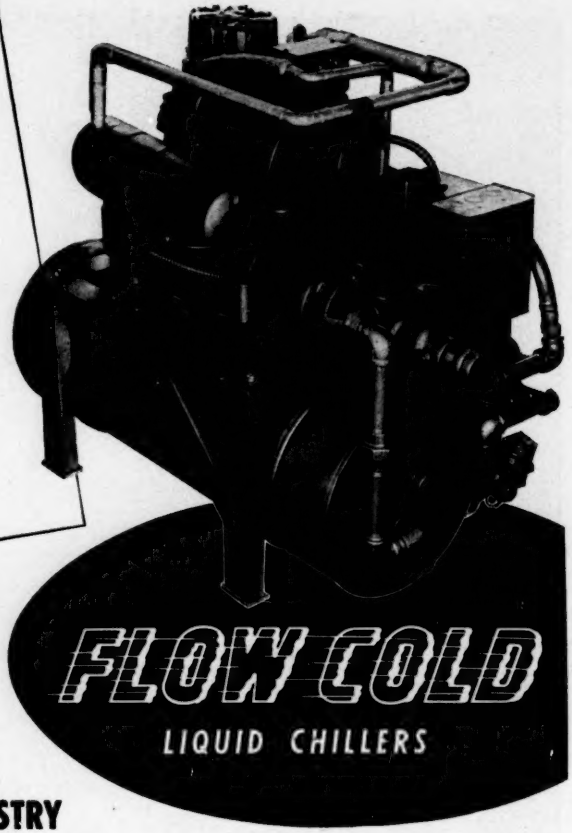

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Washington News

LORING F. OVERMAN

HEATING, ventilating and air conditioning advisory committees which had been conferring with NPA officials on industry problems in mid-February, may have been surprised at the rapidity with which some of the controls progressed from the discussion stage to reality. And some task committees, appointed to bring in recommendations, may have been chagrined to find the horse gone before they had an opportunity to lock the barn.

Case in point is Amended Order M-12 (Copper), effective February 19. Only hours after several industry advisory committees had been in Washington to discuss ways of conserving copper in air conditioning and refrigeration equipment, out came the NPA amendment showing how it is to be done.

The amendment, relaxing some controls and tightening others, fell heavily on the heating, ventilating and air conditioning industries. First, the order lifted use restrictions on copper in inventory on March 1 to permit use of the metal in manufacturing List A items (previously banned) if the copper is unsuitable for use by the person holding it in the manufacture of products not banned.

Next, however, the amended order published a List B, banning the use of copper, except as specifically provided for in the order, on new items of builders' hardware, building materials, clothing accessories, furniture and fixtures, household electrical appliances, refrigerator and water heater installation connections (except for high pressure LPG connections from tank to fixture), and a long list of commercial and industrial refrigeration and air conditioning machinery and equipment.

Copper Banned

List B of the amended order observes: "The use of the forms and products of copper defined in (part) 29.23 and of any component parts made therefrom in the items listed below (excluding repair parts) is prohibited:

"Except where copper products or copper base alloy products are essential for the following: carbonators, complete condensing units less condensers, dehydrators, draft arms for soda fountain equipment, electrical controls and wiring, fittings, protective coating refrigerant circuits (except in condensers for open type air-cooled condensing units and evaporating condensers for Freon refrigeration or air conditioning systems and the low side refrigerant circuits for ice cream cabinets, frozen food cabinets and 'wet type' bottled beverage coolers), refrigerant connections between compressor and cooling coils, refrigerant flow control valves, sight glasses, soldering and brazing materials, strainers, suction line heat exchangers, tube sheets, valves, water cooler low sides and pre-coolers, water flow control valves and water spray nozzles for evaporative condensers, evaporative coolers, and air washers."

Commercial and industrial refrigeration and air conditioning machinery and equipment including but not limited to:

- Air conditioning systems, self-contained or remote.
- Air washers.
- Blast coolers.
- Blast freezers.
- Bottled beverage coolers.
- Carbonated beverage dispensing systems (except coin-operated).
- Compressor stop valves (except valve seats, gaskets, bonnets, discs, disc screens and protective covering for valve stems).
- Evaporative condensers.
- Evaporative coolers (desert type).
- Finned air-cooled condensers (except those for hermetic systems where the condenser is exposed to the outside air, or for transportation systems).
- Finned coils or evaporators.
- Florist refrigerators.
- Fountainettes.
- Frozen food cabinets.
- Ice cream cabinets.
- Ice cube makers.
- Malt beverage dispensing systems.
- Mortuary refrigerators.
- Non-carbonated beverage dispensing systems (except coin-operated).
- Packaged air conditioners (room, window and store coolers).
- Reach-in refrigerators.
- Refrigerated display cases.
- Refrigeration systems, self-contained or remote.
- Reverse cycle heating and air conditioning systems (heat pumps).
- Sandwich units.
- Shell and tube or shell and coil condensers.
- Shell and tube or shell and coil water chillers.
- Soda fountains.
- Space coolers.
- Unit coolers.
- Walk-in refrigerators.
- Water coolers, except bubblers and bubbler connections.

Committee Previewed Order

To explain policy to industry, and to receive industry's suggestions, defense planners are holding frequent meetings with Industry Advisory Committees. In mid-February the Commercial and Industrial Refrigeration and Air Conditioning Manufacturers Industry Advisory Committee met with officials of the National Production Authority and discussed measures intended to conserve scarce materials used in their products.

Members of the committee said their industry needs 90 days advance notice before any new NPA orders are issued to govern the use of steel or other materials.

ANOTHER LESSON IN PREVENTIVE MAINTENANCE

PENN VALLEY SCHOOL
School District of Lower Merion Township, Ardmore, Pa.
WALTER T. KARCHER & LIVINGSTON SMITH
Registered Architects
A. E. D'AMBLY
Consulting Engineer

BYERS WROUGHT IRON PIPE
safeguards this
RADIANT HEATING INSTALLATION

To heat the seven-eighths of a mile of interconnected buildings that comprise this new $1,500,000 school, the designers applied modern and functional principles, so apparent in the architectural design, to the heating system with a combination of radiant heating and tempered fresh air. To safeguard the heating installation against excessive maintenance and premature failure, they followed sound, proven practice by specifying wrought iron for the underfloor coils.

One inch Byers Wrought Iron pipe was imbedded in the concrete floor of this extensive one-story, basementless structure. Hot water, with an antifreeze solution, circulated through these pipes, heats the floor which radiates warmth throughout the class rooms. A portion of the installation is shown in the small picture. The pipe was fabricated and installed by Willard Sales & Service, Inc., working in conjunction with National Sheet Metal Company. The latter organization installed the supply ventilation system, under thermostatic control, which provides a dual system of comfort conditioning for the class rooms.

Radiant heating has rolled up an impressive record as an ideal heating system for schools. Byers Wrought Iron pipe is the first choice of experienced engineers for this service because of its unusual combination of advantages. It is readily formed and welded which speeds and simplifies installation. Its emission rate is high. It expands and contracts at practically identical rates with concrete and plaster, and so can be safely imbedded in these materials. It has ample mechanical strength to withstand damage during installation periods. And its corrosion resistance under similar operation conditions has been demonstrated in hundreds of installations, over periods of many years.

Ask for our bulletin, BYERS WROUGHT IRON FOR RADIANT HEATING for the complete story.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, San Francisco. Export Division: New York, N. Y.

WHY WROUGHT IRON LASTS

This notch-fracture test specimen illustrates the unusual fibrous structure of wrought iron—which is responsible for the unusual corrosion resistance of the material. Tiny threads of glass-like silicate slag, distributed through the body of high-purity iron, halt and disperse corrosive attack, and discourage pitting and penetration. They also anchor the initial protective scale, which shields the underlying metal.

BYERS

CORROSION COSTS YOU MORE THAN WROUGHT IRON
WROUGHT IRON
TUBULAR AND HOT ROLLED PRODUCTS
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This "lead time" is necessary, according to the committee, to allow manufacturers to schedule production. They also suggested that supply percentages, if applied to the industry, be based on periods longer than quarter-years, NPA said the industry request for a longer lead time or conversion period would receive consideration in drafting any order that would affect the industry's products directly.

A task committee appointed January 29 from the advisory committee reported it is working on recommended minimum specifications for the production of a long list of products. The committee pointed out that many of its products cannot be made satisfactorily without using certain amounts of copper.

A task committee recommendation covering schedules for condensing units, water coolers, and valves and fittings was scheduled for release to NPA on March 1. In order to speed the advisory committee's work of providing NPA with other information, new task groups were scheduled to be appointed soon.

Committee members estimated that about 6% of the dollar volume of their industry's products has been in maintenance and repair supplies, and requested information from NPA as to prospects for obtaining materials for that purpose. NPA advised that the matter is under considerations. William L. Beck, Deputy Director of NPA's Machinery division, presided at the meeting, assisted by Sterling Smith, Industry Consultant.

Boiler Output Down

Members of the Boiler and Related Industry Advisory Committee, meeting with NPA on February 16, reported that the industry is operating about 25% below capacity because of insufficient supplies of steel, stainless steel, chrome-molybdenum and chrome-nickel alloys. They said the industry will be able to meet any foreseeable demand if these materials become available. Products of the industry include water tube boilers, horizontal steel firebox boilers, packaged and large steam generators, waste heat boilers, portable oil country boilers, coal stokers and coal pulverizers.

NPA appointed a task committee to study conservation of critical materials and standardization and simplification of boiler design. Task committee members are: F. G. Brinig, Erie, Pa.; C. W. Miller, Williamsport, Pa.; and P. W. Foster, New York. Other members of the advisory committee are: W. T. McCullough, Jr., New York; Paul M. Fleming, New Haven, Conn.; F. H. Daniels, Worcester, Mass.; L. C. Train, Chattanooga, Tenn.; W. Ainsworth, New York; F. W. Hainer, Milwaukee, Wis.; R. J. Bros, Minneapolis, Minn.; R. J. Stormont, Saginaw, Mich.; and A. B. Shafer, Seattle, Wash.

Surface Heating

An industry advisory committee representing Extended Surface Heating Equipment Manufacturers was also in conference with NPA during February. The industry produces baseboard heating units, convectors, and cabinet-type heating units. NPA officials told the committee that in order to save copper and aluminum, substitute materials should be used in the manufacture of ornamental grilles, cold air intake boxes and other parts not requiring scarce materials. A promised conservation order would limit copper tubing for blast coils to certain nominal lengths. In addition, casing, enclosures and parts would not contain any metal other than iron and steel, except for small fittings.

A special task committee was appointed to study the general situation as it affects the manufacturers in the baseboard heating segment of the industry. This group is to report to NPA its recommendations for applying conservation measures.

Put and Take

The Munitions Board has decided to cut in half the present rate of copper stockpiling, and will review the copper situation every three weeks to determine whether the stockpiling rate should be changed.

In another action dictated by practical considerations, NPA modified Order M-25, the tin can order, to permit the packing of additional products which could not be successfully packed in uncoated containers.

Gas Council Formed

Secretary of the Interior Oscar Chapman met on February 20 with 30 representatives of the gas industry to arrange for formation of an industry advisory council similar to the National Petroleum Council. Secretary Chapman also asked industry advice on the appointment of an Assistant Deputy Director of the Petroleum Administration for Defense to handle gas industry mobilization problems. Reginald H. Hargrove, of Shreveport, La., has been appointed Acting Assistant Deputy Director for gas matters.

Gas transmission and distribution companies have been demanding their own mobilization agency within the Interior Department, but Secretary Chapman asked them to accept fuller representation on the NPC instead. The formation of the gas industry group represents a compromise between the industry and department views.

$16.4 Billion in 7 Months

During the first seven months of fiscal '51, the Defense Department's procurement obligations totalled $16.4 billion. For January the total commitments were $4.4 billion. Total military budget for the year has been set at $31.8 billion.

For the July, 1950-Jan., 1951 period, inclusive, the Department summary of procurement obligations shows:

Hard goods (aircraft, ships, tanks, weapons, ammunition, other equipment)	$14,100,000,000
Clothing, subsistence, petroleum products	1,500,000,000
Military construction, facilities expansion	800,000,000

Of the $16.4 billion obligated, the Army accounts for $6.4 billion; Navy, $3.4; and Air Force, $6.7. Procurement for the mutual defense assistance program accounted for $1.7 billion.

BRIEFLY STATED

• The University of Wisconsin Extension Division and the College of Engineering in cooperation with the National Warm Air Heating and Air Conditioning Association are planning a Warm Air Heating Institute to be held on the university campus in Madison, March 13, 14 and 15, 1951. This Institute will be attended by those who manufacture, install, and service warm air heating equipment.

• A new technical committee, which is to concentrate its work on the formulation of methods of atmospheric sampling and analysis, the selection of acceptable nomenclature and definitions and the stimulation of research to accomplish the foregoing purposes, held its organization meeting at the headquarters of the American Society for Testing Materials in January. Dr. L. C. McCabe, chief, Air and Stream Pollution, U. S. Bureau of Mines, who had been designated temporary chairman of the new D-22 committee, presided.

• A special laboratory, recently designed and constructed by the Building Technology Division of the National Bureau of Standards, eliminates the major difficulties that have in the past led to anomalous results in the accelerated durability testing of exterior covering materials. Developed primarily for studying organic coating materials such as asphalts, tars, and paints, the new facilities are sufficiently flexible to meet the requirements of most materials exposed to weathering.

• General Controls Co. of Glendale, Cal., is planning to build a new factory and warehouse in Skokie, Illinois, located just a few miles north of Chicago.

• The H. K. Ferguson Company, industrial engineers and builders, has entered 1951 with a backlog more than 50% greater than the previous year. New business in 1950 tripled the volume sold in 1949.

• Fairbanks-Morse & Co. has discontinued its heating division, which formerly manufactured oil burners, furnaces and stokers. The company has advised that parts for all of its stoker equipment will be available from the Worley Heating Service, 1716 West Adams St., Chicago, Ill. The Worley organization has been a Fairbanks-Morse distributor for twenty years.

• F. J. Van Poppelen, formerly manager of manufacturing of the General Electric Company's Air Conditioning Department, with headquarters at Bloomfield, New Jersey, has been named assistant general manager of the Department.

• The total land area occupied by the installations owned by the Atomic Energy Commission comprises some 2,800 square miles—an area almost equal in size to the states of Delaware and Rhode Island combined. These holdings are located in 19 states and include Eniwetok Atoll in the Pacific Ocean.

• Under the proposed Miami Code for Buildings drafted by the code revision committee named by the city commission of the City of Miami, Fla., a new administrative organization would be established to meet changing methods and techniques and the use of substitute materials in construction. The new code would be administered by a Department of Buildings, with seven separate divisions—structural, electrical, plumbing, mechanical zoning, safety, and civic. A separate board of building appeals would be established before whom any ruling of the Department of Buildings might be contested. Protesters and the building department would appear before this board as equal parties.

• More than 200 cities and counties in the continental United States and insular possessions took steps to qualify for participation in the slum clearance and redevelopment program provided for under Title I of the Housing Act of 1949 during the first year's operation of the federal aid program. At the end of the calendar year 1950, a total of 222 localities in 31 states, the District of Columbia, Hawaii, Puerto Rico, and the Virgin Islands had capital grant reservations outstanding in the amount of $172,896,023. Of these localities, 71 had obtained agency approval of planning advances amounting to $3,065,639, and 41 localities had obtained prior approval of expenditures from local funds which may later be included in the total cost of the federally-aided projects.

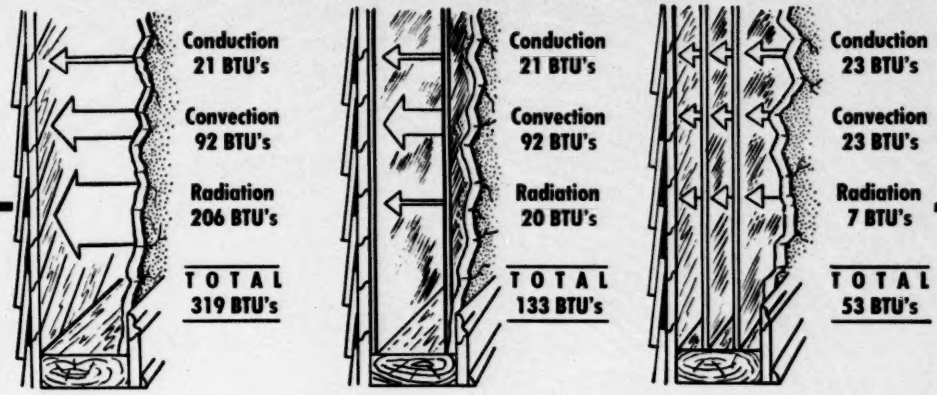
• The Director of Public Information, Office of the Secretary of Defense, has added to the public information organizations an Industrial Services Branch for the dissemination of information of special interest to industry (management and labor). Generally, this Branch will combine the functions of the Industrial Services Division of the War Department and the Industrial Incentive Division of the Navy Department during World War II. It is expected that a periodic release of information originating in the Department of Defense and dealing with the current industrial mobilization buildup will be made available to the industrial press and to plant publications in the near future.

• A direct-reading vapor-pressure psychrometer has been developed by the Naval Research Laboratory for use in taking humidity measurements where sub-freezing temperatures and precipitation exist. Using this device instead of the more common sling psychrometer, it is possible to make observations from inside a heated room, and to read the measured humidity directly in terms of water-vapor pressure without referring to psychrometric tables. Three types of the instrument have been designed.

• C. A. Dunham Co., Chicago, manufacturer of heating systems and equipment, has established a new Defense Contract Office. This office will be headed by Edward F. Ford, formerly manager of marketing and promotion, and divisional sales manager for the company.

• Rockwell Manufacturing Company has announced the acquisition of both the Pittsburgh Valve and Fittings Division of the Pitcairn Corp., and the Pittsburgh Valve and Fittings Corp., a subsidiary of the Pitcairn Corporation.

In an uninsulated wall space, 65% to 80% of all heat flow is by RADIATION



CASE 1
Uninsulated wall space

CASE 2
Inner surfaces lined with 15% emissive metal

CASE 3
2 sheets of 15% emissive metal make 3 reflective spaces

CASE 1:—An uninsulated wall space. The surfaces of ordinary building materials, including ordinary insulations, have a Radiation or emissivity rate of more than 90%, a heat ray absorption rate of over 90%. Air has slight density, so Conduction is slight, 21 BTU's. There is nothing to block convection, 92 BTU's. *Note:* **206 BTU's out of total 319 BTU's going through this wall space was Radiation.**

CASE 2:—The same wall space except that inner surfaces were lined with sheets of metal of 15% emissivity and absorption. Note drastic drop in heat flow by radiation, from 206 BTU's to 20 BTU's. Conduction and Convection stay the same. **Original total of 319 BTU's dropped to 133 BTU's.**

CASE 3:—Two sheets of 15% emissive metal divide the wall space into 3 reflective compartments. Heat loss by Radiation dropped to 7 BTU's against original 206 BTU's. The 2 sheets blocked Convection so that its flow fell from 92 BTU's to 23 BTU's. Conduction rose only 2 BTU's; from 21 to 23 BTU's. **The total flow in BTU's dropped 85% from the original 319, to 53 BTU's.**

The aluminum used in multiple sheet accordion insulation has emissivity and absorption rates of only 3%, or 5 times better than the 15% cited. Type 4 Infra, a commercial form of multiple aluminum, has 3 blocks to Convection heat flow, and Type 6 Infra has 5 blocks, against only 2 cited in Case 3.

NOTE: Figures based on booklet, "Insulating Effect of Successive Air Spaces Bounded by Bright Metallic Surfaces," published by the American Society of Heating & Ventilating Engineers. Free copy will be sent by Infra; just use coupon.

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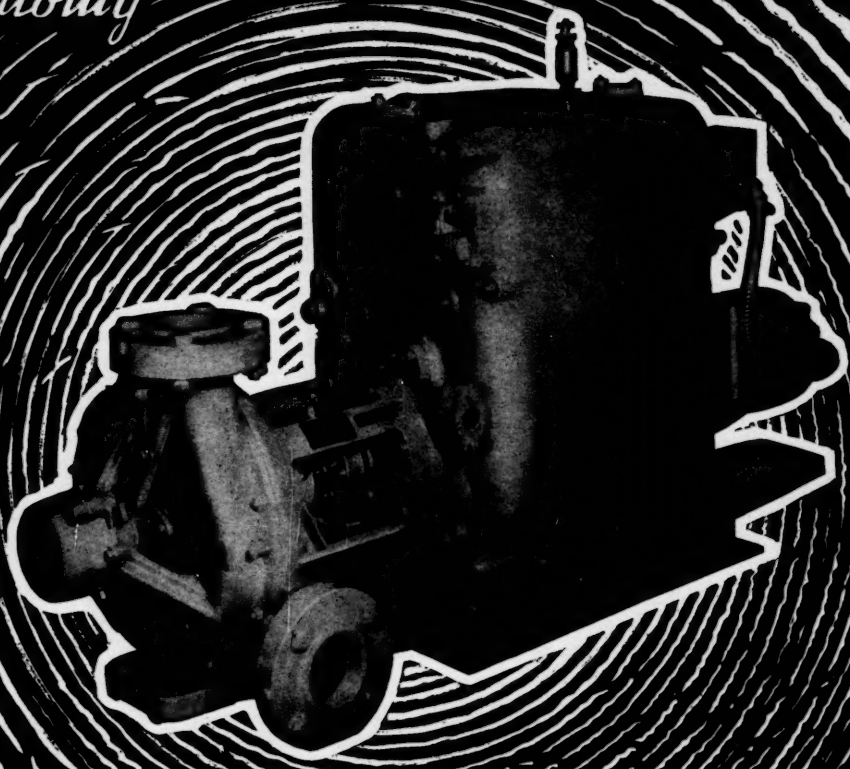

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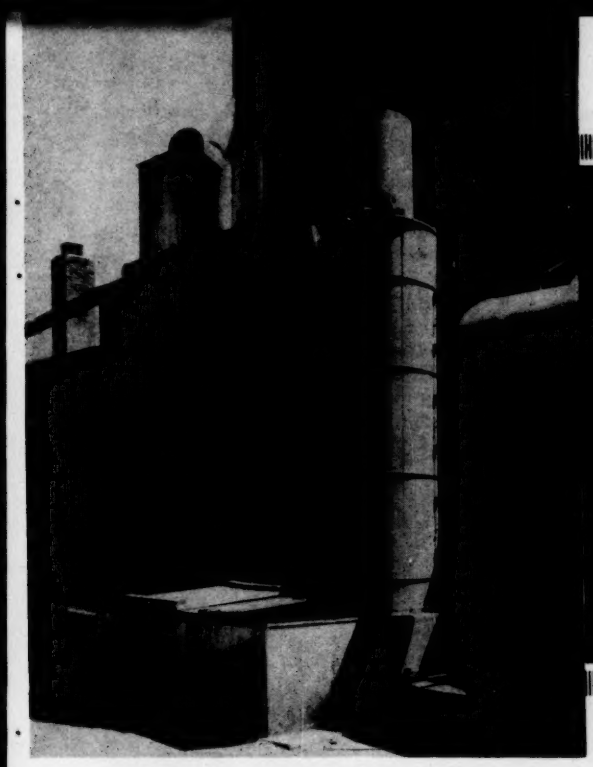


Theory and Practice of the Fog Filter Air Scrubber

DUNCAN G. HUDSON
Chief Engineer, Dust and Fume Control Division
R. C. Mahon Co., Detroit

(Left) Two-tower fog filter at Lansing asphalt plant.

Wet scrubbers using sprays, foam, waterfalls, and wet impingement surfaces for contact with air contaminants are adequate for many air cleaning jobs and compete in performance with improved, modern, dry collectors of the centrifugal type. Wet scrubbers, in addition, have unique capabilities for the finer dusts, corrosive and adhesive fumes, gases, and the higher temperature applications. The principle of the fog filter is described and some example applications given.

IN view of increasing air pollution restrictions and the vastly enlarged chemical processing industries, an increase in scrubber capabilities and efficiencies is desirable. Breaking the scrubber water particles into finer sizes or fog has opened the door in this direction so that now a good scrubber of this type can give efficiencies on certain air contaminants as high as may be desired. Decision on the method of air purification in each instance then becomes one of economics for the particular application.

Since the heart of the fog filter scrubber is the efficient generation of water fog in a tower, it will be well to review the principle of the fog filter in this use.

Fog is necessary for two effects, one to reduce the voids or the mean free distance between particles of water so that wetting is mathematically more probable; and secondly, to secure greater total surface from a given amount of water in order to take advantage of such solution or attractive forces as are possible.

By reducing the water particle sizes in the scrubbing tower to a minimum, totally new effects are secured. Fumes, oil mists, sub-micron size dusts, such as carbon black and materials only slightly soluble in water can now be collected to a satisfactory degree in scrubbing towers.

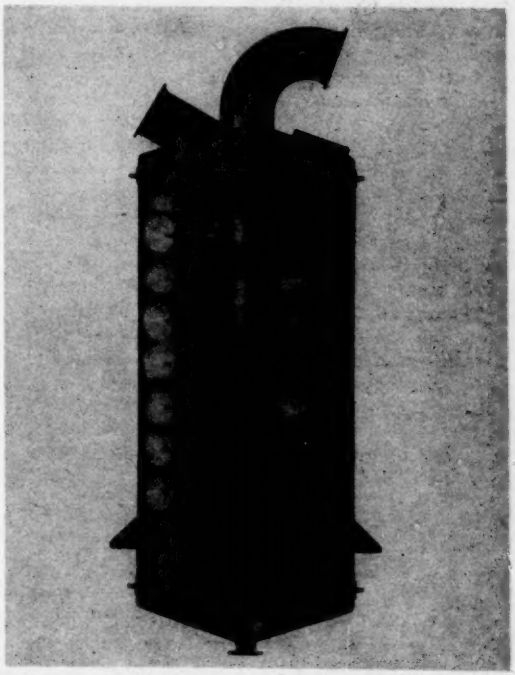


Fig. 1. Fog filter section showing operation.

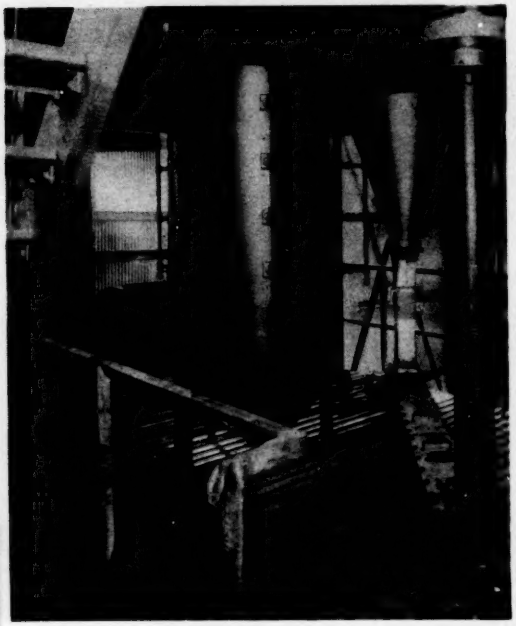


Fig. 2. Fog filter for high temperature lime fumes at pilot recalcining plant.

There is a great difference in scrubbing effect between low pressure sprays and high pressure fog. As an illustration, a coal mining machinery manufacturer had developed a machine to mechanically mine coal. Any such machine is inherently abrasive at the coal seam face. As a result, a large amount of fine coal dust is created and then suspended in the air by air currents generated by the rapid movement of the cutter teeth.

To wet this dust, water sprays of the best type available were installed near the cutting head, using a pump providing 80-lb pressure. This provided some relief for the machine operator but the cloud was not knocked down to the desired and practical amount. When a 400-lb pressure pump with suitable nozzles was employed, the coal dust cloud was completely eliminated and a saving in the water requirement was effected.

The manufacturer showed a 1/10,000-second exposure photograph of the 80-lb pressure spray pattern but the water particle at the lower pressure was shown to be, in effect, a torn sheet of water extending from the nozzle orifice for a distance of approximately 1½ inches. This sheet and its ruptured fragments moving around in the cone space gave the optical illusion of a fine fog.

True Fog

Such a condition is quite different from that of a true fog where energy in the form of high water pressure is available to provide for the generation of more water surface. With more surface available, the shape assumed by the particle tends to move toward that of a sphere with the median diameter varying approximately and inversely with the cube of the pressure employed. With saline solutions at 5,000 pounds pressure, Drs. Kurata and Sliepcevich at the University of Michigan have provided a fog that will stay in suspension in a sealed room for 15 minutes. Ordinarily such fine particles of water are difficult to separate out from the suspending air because of their very fine size, but it does illustrate that work is necessary to produce a fog.

The difference in physical measurement between spray particles and fog particles is relative, but I would say from experience that fog generation as a function of hydraulic pressure will start at 200 pounds pressure for practical results in air filter work and go up to 600 pounds, depending upon the chemical nature, size and loading of the contaminant.

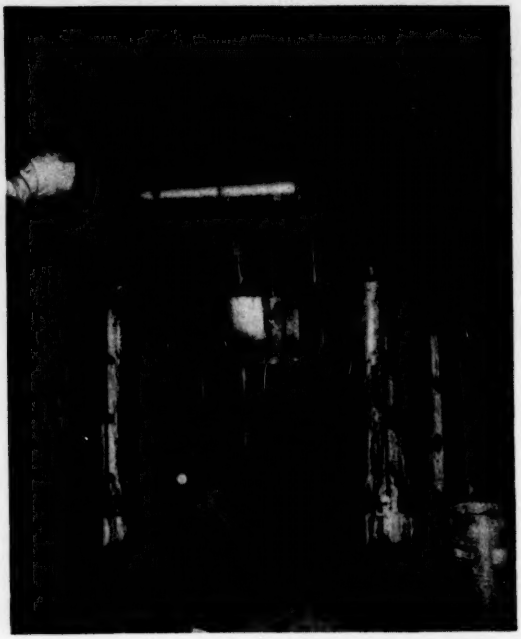


Fig. 3. Two-tower fog filter for lead oxide fumes from blast furnace.

Filter Development

The first installation of the fog filter, as this type of equipment is called, was at the City of Lansing Asphalt Plant, where fine silica dust from a gravel drying kiln was escaping through a dry collector of the cyclone type and had become a community nuisance. A 7 by 7 by 14-foot cabinet was constructed for the filter. It had a vertical dividing partition in the middle and half way to the bottom, providing a "U" shaped passage for the dust-laden air. A number of spray nozzles were placed on the inner walls, facing at right angles to the path of air travel.

After experimentation with various spray nozzles and pump pressures, it was found that at least 300

pounds and preferably 500 pounds water pressure was necessary. The wet dusts collected from the filter effluent amounted to about 4 tons per day and were washed from the filter into a nearby river.

This installation disclosed a high degree of wetting ability when high pressure fog was employed, and a way was presented whereby such lightweight fine material could be centrifuged out of the air, since a wetted fine air contaminant would have more mass than when dry. To secure a cyclone action in the wetted gases, advantage was taken of the fact that kinetics of fog particles from high pressure nozzles provide an excellent induced draft air pump. All air entrained must necessarily move with substantially the same high velocity as that of the fog particle.

By placing a number of these nozzles around the inside of a round vertical tower and pointing them in the same angular direction in horizontal planes, the combined effect was to rotate all of the air mass in the tower about that axis and at a very high angular velocity. This design is shown in Fig. 1.

Since centrifugal force varies with the square of the angular velocity, it is possible to throw to the internal wall of the tower the very fine wetted contaminants. At the internal wall, they become part of the liquid

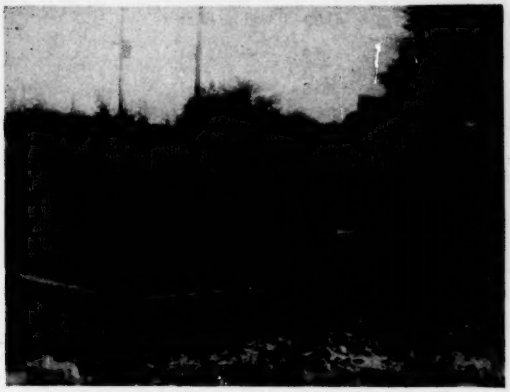


Fig. 4. Cascade porous settling tanks.

effluent draining to the base where they are washed to any place desired. The high pressure fog also has a scouring action and minimizes the caking of solids on the tower walls.

Dry Cyclone in Series

The original square box air filter equipment at the City of Lansing Asphalt Plant was replaced after three years of use with a larger round tower design as shown in the headpiece of this article to handle additional dust loading. A conventional dry cyclone collector commonly used for such plants was placed in series ahead to the fog filter. Tests have not been run on this very satisfactory operation, but it is of interest to note that the condensed fog falling as a rain for a radius of approximately 50 feet around the old square model has now been eliminated entirely in the new round tower unit. While the operator has used as low as 100 pounds water pressure he now has 200 pounds pressure on the river water used. The fog nozzles are cleaned about once a month and 35 gpm is required for approximately 6,000 cfm.

The air resistance of 2 to 5 inches spwg for this class of equipment is very low considering the job done. The total horsepower required, including pump and blower, is from 1 to 3 hp per 1,000 cfm depending on the size of the fog filter and the nature of the air contaminant. A small unit has been in operation for over a year at the City of Lansing Water Works collecting lime fumes from a pilot recalcining furnace operation. There has been no complaint even though this plant is in the midst of a retail business and residential section of the town. Shown in Fig. 2, this unit is handling fumes of over 800F at from 300 to 1,500 cfm and using 9 to 11 gpm fresh water. A spot check by the user showed over 90% total weight collection efficiency.

Lime deposits are for the most part eroded from the tower walls by the drive of the fog. Accumulations of solids that tend to "bridge" over the conical outlet of this tower are continuously broken up by a jet of water. In large applications of such an adhesive character, there is generally employed a water seal sump in place of such a conical bottom.

Lead Recovery

Fig. 3 shows an early two-tower unit employed at a small scrap lead (battery) smelter. This was the first

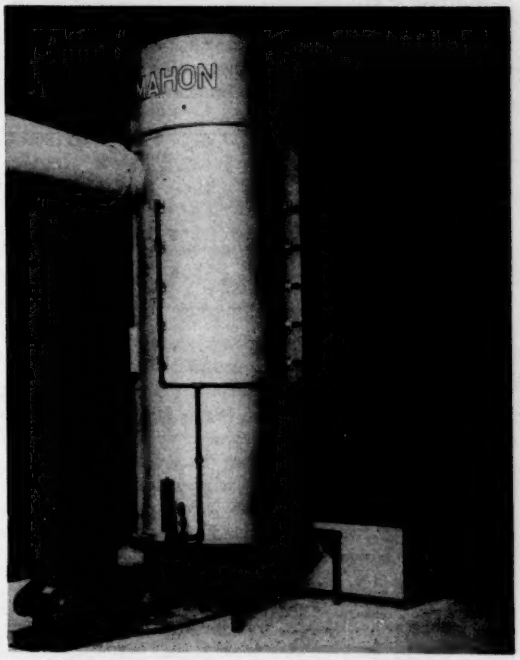


Fig. 5. External arrangement for removing nozzles.

round tower unit erected and experience has shown that it should have been a little larger to secure best results. However, it is very satisfactory from an economic point of view. This equipment collects 87% of the 12% lead lost to vapor by the blast furnace. The water effluent from the towers flow to porous cinder block settling tanks shown in Fig. 4. Since these cascade tanks are in duplicate they can be used alternately so that while one set is loading up with the lead oxide, fly ash, carbon and other impurities, the other tank series is being cleaned out. The moist lead sludge thus reclaimed is mixed with sawdust and charged into the furnace for its lead recovery value. Test data on this early model is as follows, using 20 gpm water at 400 psi to clean 3,000 cfm inlet gas at 230F:

	Dust Count, MPPCF	Tot. Wt., Gr. per cu. ft.	Organic Material, Gr. per cu. ft.	Lead Grams per cu. ft.
Inlet	81,000	0.80	0.40	0.43
Outlet	7,952	0.20	0.16	0.012
Efficiency, %	90	75	60	87

The fog filter with fresh water as the fogging fluid will collect in satisfactory amounts practically all the fumes except NO_2 (when associated with H_2SO_4) and H_2S. In the latter case Kropp (Scrubbing Devices Successfully Control Air Pollution from Refinery Processes, E. P. Kropp, Petroleum Processing, Vol. 5, No. 6, Page 627) has shown high efficiencies when a solution of soda ash is used. Gases (except CO_2) are readily scrubbed by this method but hydrocarbon vapors of carbon tetrachloride or trichlorethylene show low collection efficiencies. Fine inactive ducts, smoke or mists in light loading conditions can be more economically collected by other means, but for those contaminants which are in heavy concentration, are corrosive, adhesive, at high temperature or have fume characteristics, the use of the fog filter is frequently desirable. Unlike other collectors this type of equipment works more efficiently as the air contaminants become finer and sub-micron size particles present no problem.

Corrosive Gas Scrubbing

In the case of relatively small amounts of corrosive gases free from dust contaminants, scrubbing can most economically be done by corrosion proof packed tower.

While it is preferable to use fresh water in the fog filter, the water effluent from the towers can be recirculated where dust is the air contaminant, providing a settling pond or mechanical water filter is employed. In the case of chemical fumes or gases where the water effluent quickly becomes critically acid or caustic, a neutralizing chemical must be added. It is, however, cheaper to use fresh water in many instances.

To minimize nozzle plugging, the water should be free from adhesive contaminants and to secure best efficiency the water used should not be over 125F. Nozzle mounting can be provided so that they can be removed externally without having to enter the tower for that purpose, as shown in Fig. 5.

TABLE 1—PERFORMANCE DATA OF VARIOUS FOG FILTERS.

Scrubbing Fluid			Gas Handled		Contaminant		Fog Filter Size
Nature	Vol., gpm	Pressure, Psig	Cfm	Temp., F	Nature	% Removed	
Water	13.15	450	194	100	$Zn Cl_2$	97.2	small pilot
Water	20.00	400	328	Atm.	SO_2	91.2	large pilot
Water	20.00	400	950	Atm.	SO_2	28.0	large pilot
Water	20.00	400	328	Atm.	H_2SO_4	98 5	large pilot
Water	20.00	400	950	Atm.	H_2SO_4	94.0	large pilot
Water	15.00	400	270	Atm.	H_2SO_4, SO_3, SO_2	86.0	large pilot
Water	8.6	500	125	Atm.	Same	92.0	small pilot
Soda ash solution	8.6	500	125	Atm.	Same	95.0	small pilot
10% caustic soda solution	20.0	400	1,000	250	H_2S & fat odor	100	large pilot
Water	21.4	400	700	450	Flux oil Fumes	90.9	small pilot
Water	15.8	450	2,500	room	Shakeout dust	99.3	lab. model

Tower Size

It has not proven practical in most cases to adopt the high pressure fog principle to existing structures, such as stacks, conventional scrubbers, etc. It is necessary to provide a certain amount of gas transit time or tower size if high collection efficiency and absence of mist emission is to be assured.

To illustrate the degree of efficiency of this method of air purification, performance data on some air contaminants is shown in Table 1. It will be noted that some tests are on full size fog filters, while others are on smaller pilot models where the water consumption is relatively higher due to the small dimensions of the unit. Experience has shown that the larger the tower used, the higher the efficiency in scrubbing.

Application of Down-Draft Exhaust Ventilation

As used in Automatic High-Speed Soldering of Metal Containers

E. D. SALLEE
Research Division
and
R. B. CARTER*
Construction Division
American Can Company

It is essential to provide local exhaust ventilation for the automatic soldering of metal containers. The fumes and dust evolved during such operations present serious maintenance and housekeeping problems, are irritant and can be harmful to plant personnel if not adequately controlled. A method of control is described.

THE machinery employed for high-speed fabrication of the bodies of the popular tin can is quite similar in all can manufacturing plants. It consists of a bodymaker machine which takes tin plate sheets, previously cut to the proper size, and forms them into cylindrical can bodies, which then pass to a side-seamer where the cans are soldered. This is done by passing the can body over a solder bath with the side-seam in contact with a rotating solder roll extending the length of the bath and about half submerged in the molten solder. Following application of the solder, the cans pass over a blast of flame which flows the solder into the seam. The excess solder is then removed by means of a revolving cloth or fiber wiper wheel following which the seam is cooled by a blast of air and/or by contacting the outside surface with water. The can body then passes on to other machines for crimping on the bottom end. This sequence of operations at the side-seamer is illustrated in Fig. 1. The operations are continuous and fully automatic.

Exhaust ventilation is necessary for the fumes evolved at the solder bath and the dust and fumes originating at the wiper station. The latter is usually exhausted separately, since the solder dust may be recovered and refined. This discussion concerns only the solder bath exhaust.

The solder bath size varies with different models of side-seaming machines, depending on the type and size of the can being fabricated, the type solder, etc. The inside dimensions of the majority of solder baths are about 39 inches in length and 16 inches in width, with a solder depth of about 3 to 4 inches. The temperature of the bath is maintained at 600-750F., varying with the composition of the particular solder employed. Temperatures must be maintained sufficiently high to assure efficient mechanical soldering and yet not be so high as to cause scorching of enamel lining or lithography on the can or other undesirable effects.

To aid in soldering and in keeping the roll tinned with solder, as well as to minimize oxide formation, a crystalline flux composed essentially of zinc ammonium chloride is kept on the bath. In most cases also an organic liquid flux is applied directly to the can seam

*Deceased July 19, 1950.

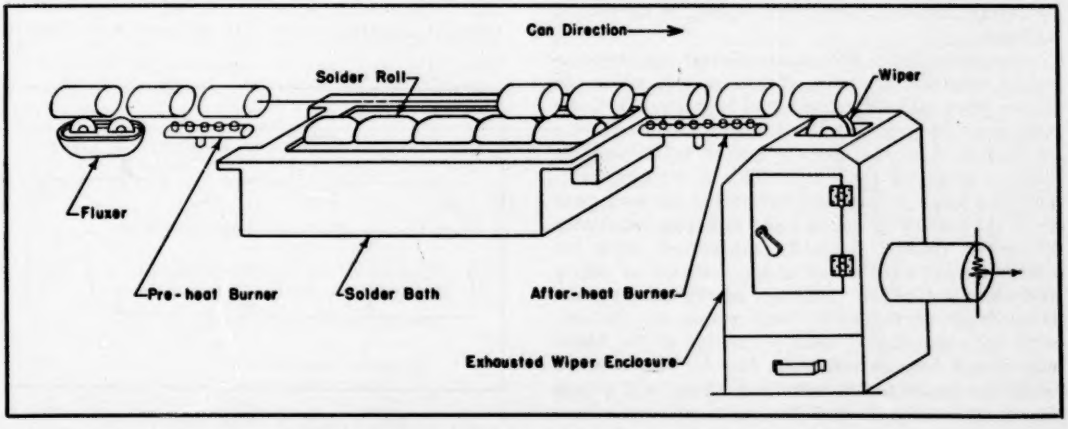


Fig. 1. Pertinent equipment for a modern side-seamer for metal containers.

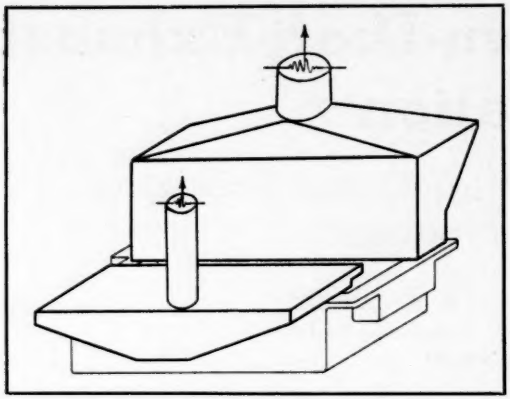


Fig. 2. Conventional main and auxiliary up-draft solder bath hoods.

prior to soldering. The fumes evolved at the bath, therefore, are composed primarily of ammonium chloride and zinc ammonium chloride with a small amount of zinc chloride and trace quantities of chlorides of tin and lead, metallic tin, lead and zinc, and oxides of these metals. The fumes may also contain traces of hydrochloric acid and volatilized and/or partially oxidized organic components of the liquid flux. The bath temperatures are not sufficiently high to volatilize significant quantities of metallic lead.

During the past several years various designs of solder bath ventilation systems have been developed. Practically all of these have been up-draft types since it is sound engineering practice to take advantage of the considerable thermal effect or "lift" given the fumes by the high temperature of the bath. If it were possible to employ a canopy type hood of such design that the bath could be kept practically enclosed at all times, this thermal effect would be sufficient to provide adequate fume exhaust without use of fans. High-speed can production requires, however, that the operators have frequent access to the solder bath for observation of the actual soldering operations, adjustment of equipment, skimming off dross, replenishing solder and flux, etc. Total enclosure is not feasible, therefore, and it is preferable to employ mechanical exhaust.

The mechanically exhausted up-draft systems currently employed are very efficient in exhausting the fumes when maintained and used properly. Their design must be such that there is as little interference as possible with the operator's work in tending the bath or adjusting machinery. This is done by incorporating means of conveniently moving the hood away from the bath or by use of doors or panels which may be opened readily. Normally, the periods when the operator must have access to the bath are of only a few seconds duration. Efficiency of the system is decreased, of course, during these momentary periods, with the result that a small proportion of the fumes may escape into the workroom air. No fumes escape when the hoods are in place with doors and panels closed. Air tests, clinical data and experience have shown consistently that the extent of fumes which do escape is of no significance from a health standpoint. Nevertheless, it would be desirable to eliminate all fumes if conveniently possible.

Fig. 2 and 3 illustrate common types of up-draft solder bath exhaust hoods which have been and are still in general use. The system shown in Fig. 2 consists of a main and an auxiliary hood using a combination side and up-draft. The main hood is set over the left side of the bath (when viewed in the direction in which the cans travel through the machines) and the auxiliary hood slot is located at the edge of the right or clean side of the bath. Most of the fumes are evolved at the left side of the bath, since the solder and flux is added at this point and the roll is rotated toward this side. The premelting pot, which is connected to the bath and through which the solder supply is replenished, is also located at the left of the bath. Exhaust of the premelting pot is accomplished by means of an extension of the main hood. Consequently, this system is designed so that about 75% of the bath exhaust is handled through the main hood and the remainder through the auxiliary hood. On most units the total exhaust volume for the solder bath is approximately 1,000 cfm. Both hoods are connected to a single main duct. The width of exhaust slots is designed so that slot velocity of exhaust air is in excess of 1,000 linear fpm at the auxiliary hood and 600 fpm at the main hood. Both of these hoods are provided with counterbalance weights and telescopic ducts so that they may be raised conveniently for ready access to the bath and other side-seamer equipment.

The system shown in Fig. 3 is a cover-all, semi-enclosure, canopy type hood with hinged or sliding panels for access to the bath and equipment. The exhaust volume used is approximately 1,000 cfm.

These up-draft designs of exhaust equipment are very efficient when properly maintained and when kept in proper position with access panels in place. Experience has shown that they have certain disadvantages, however, and efforts to correct these disadvantages have led to the development of the down-draft solder bath exhaust system. In addition to efficiently eliminating fumes, a satisfactory exhaust system must (1) cause no appreciable interference with operator's work, (2) be conveniently manipulated; (3) minimize tendency to be used improperly; (4) be compact and not obstruct operator's view; (5) be sturdily constructed

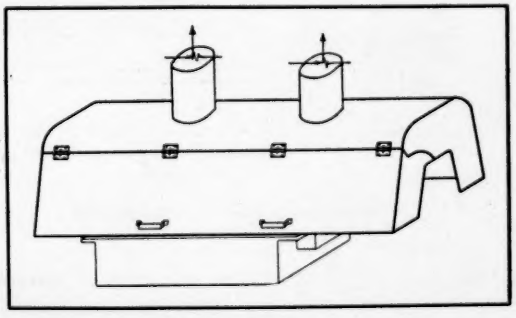


Fig. 3. Cover-all canopy type up-draft solder bath hood.

and corrosion-resistant; and (6) require a minimum of expense for installation and operation.

With these points in mind, the down-draft system illustrated in Fig. 4 was designed. This system consists of an exhaust slot on each side of the bath. Each slot is connected to a common duct. At the left side of the bath the system includes exhaust for the premelting pot and the receptacle into which bath skimmings are placed. Baffles are placed so as to obtain maximum efficiency of exhaust. Slot velocities are approximately 2,500 linear fpm and depth of slots so proportioned that three-fourths of the total exhaust volume is drawn from the left side of the bath. Total exhaust volume is 1,200 cfm—a little more than that provided for up-draft hoods. The unit is fabricated of 16-gage stainless steel.

These down-draft units have been subjected to trial use in a number of separate plants. Their suitability has been determined in each case through acceptance by the operators and through efficiency tests. Efficiency was determined by tests for fumes in the workroom air and by air movement measurements. Since the major components of the fumes are visible, efficiency of exhaust also can be estimated fairly well merely by observation.

Tests for fumes in air included determination of total air-borne chlorides, lead and zinc. Samples for total chlorides were collected by means of standard impingers with subsequent chloride determination by the Volhard method. Total air-borne lead and zinc samples were collected with M.S.A. electrostatic dust and fume samplers with subsequent analyses by means of polarographic techniques. Tests were taken in the breathing zone of the workroom personnel and at stations within a few inches of the sources in the direct path of any escaping fumes. In these determinations care was taken to eliminate possible interference of fumes which might have originated from other units in the workroom so that actual efficiency of the test unit could be properly evaluated. This was done by simultaneously sampling the general room atmosphere and correcting the concentrations found at the unit under test accordingly. Table 1 shows the results of these fume tests.

These values represent the results of 246 tests for fumes made on a total of ten down-draft units in five separate factories. The results of tests taken within a few inches of the sources of the fumes are especially indicative of the efficiency of the system. It is obvious

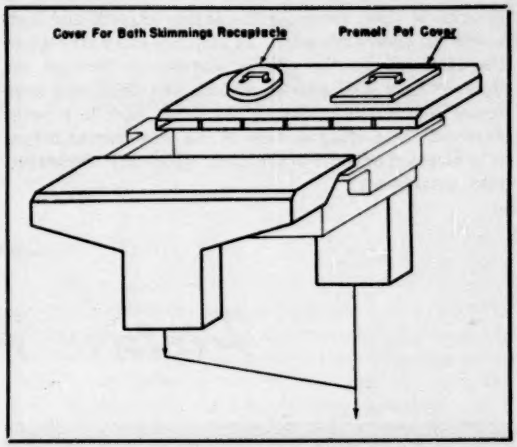


Fig. 4. Down-draft solder bath exhaust system.

that this type ventilation is particularly efficient, since in most instances the extent of escaping fumes is too low to be detectable by air tests as well as visual observation. The extent of fumes evolved at the bath varies considerably with time. Fuming is greatest when the solder is agitated, when flux crystals or solder is added, etc. It is not possible, therefore, to estimate the actual average rate of fuming. Air samples taken in the direct path of fumes rising from the bath when the exhaust had been completely shut off ranged up to 160 ppm chlorides, 200 mg zinc per 10 cu m and 18.9 mg lead per 10 cu m. Comparison of these values with those shown in the table aptly demonstrates efficiency of the down-draft exhaust system.

It is quite obvious, therefore, that by use of properly designed exhaust slots, together with high slot velocities and partial-enclosure baffles, the considerable thermal effect produced by the bath temperature can be overcome quite readily so that down-draft may be utilized. In this instance the down-draft was applied successfully with only 20% greater exhaust volume than that being used in up-draft systems.

A major point in favor of the down-draft system is that, in contrast to up-draft designs, no significant fumes escape even when the bath is being tended. With up-draft hoods the efficiency is least when it is desired most, since, in most instances, the operator is normally in close proximity to the bath only when he is tending it with the hood or hood panels raised. Another reason for preference of down-draft is that it eliminates unsightly, dirt-collecting and bulky up-draft hoods and ductwork in the solder bath area, thus aiding in maintenance of good housekeeping, improving the appearance of the side-seamer, minimizing obstruction of the

TABLE 1—MAXIMUM CONCENTRATION* OF DUST AND FUMES ESCAPING DOWN-DRAFT SOLDER BATH VENTILATION SYSTEMS

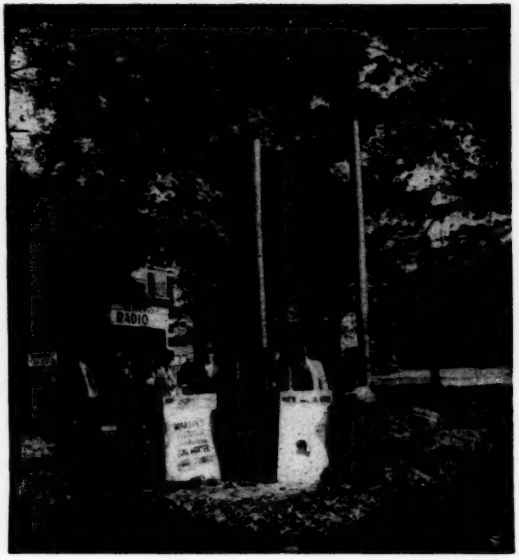
Sampling Location	Chlorides, p.p.m.	Lead, mg./10m³	Zinc, mg./10m³
Operator's breathing zone at right side of sideseamer	0.2	0.1	0.1
Operator's breathing zone at left side of sideseamer	0.3	0.3	0.1
Working area at rear end of sideseamer	.01	0.2	0.1
Six inches directly over the solder bath (in path of any fumes which might escape)	0.5	0.3	0.1

p.p.m.—parts of total chlorides per million parts of air.
mg./10m³—Milligrams of total lead (or zinc), calculated as the metal, per ten cubic meters of air.
*Most of the concenstrations found were either nil or below 0.1 p.p.m. for chlorides, or below 0.1 mg./10m³ for lead or zinc—the sensitivities of the test methods.

operator's view, reducing the safety hazard, and lessening the operator's work. In multiple-story structures the ductwork for the system may be run through the floor. Where it is not feasible to do this, it has been found convenient to extend the ducts back to a point adjacent the cooling section of the side-seamer before it is directed upward to the ducts which are discharged into outside air.

In each instance the down-draft unit has been enthusiastically accepted by plant personnel. In view of these data and observations the down-draft solder bath exhaust system is highly recommended. Although this discussion applies particularly to can manufacturing, the results obtained indicate that the principle can be adapted successfully to other exhaust problems in manufacturing and process industries.

Picture Paragraphs



A striking demonstration recently at Knoxville, Tennessee, proved that any bituminous coal can be burned without producing smoke.

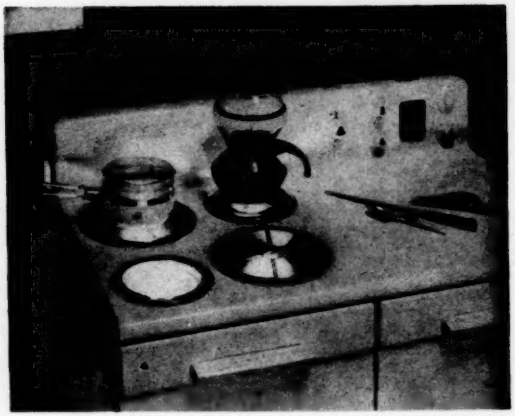
Two coal-burning heaters, one of the conventional type (right) and a recently developed smokeless unit, were operated side by side on the same high-volatile bituminous coal. Out of the stack of the conventional unit came the customary smoke but the stack above the smokeless heater was clear.

The demonstration was conducted by Emerson B. Priest, field representative of Bituminous Coal Research, Inc., in cooperation with the Knoxville Smoke Regulation Department. The demonstration was held in October in conjunction with the National Air Pollution and Smoke Abatement Week.

The smokeless coal-burning heater is a magazine-type heater with a large capacity of fuel that feeds automatically. Air for combustion is supplied from above and from the side of the unit, passing through the coal and the hot part of the fire. As a result, there is a gradual release of volatile matter that is thoroughly mixed with air. A high enough temperature is maintained to assure combustion.

The new combustion principle permits the heaters to burn a wide variety of bituminous coals. More complete combustion means higher efficiency and smokeless performance. Less fuel is consumed, less ash is produced, and no clinkers are formed. A high-limit control on the unit prevents the heater from operating above rating, but leaves full chimney draft available for rapid heat pick-up.

To give dealers practical experience in installing the new Blend-Air heating and ventilating system, one section of the Coleman Heating Institute, a factory training school in Wichita, Kans., includes a simulated frame dwelling. Trainee at left has just completed installation of a concealed blender. Others are assembling Blend-Air System's unique heat tubes. This year, 1,600 dealers will get expense-paid trips to the Institute.



Infra-red cooking in household ranges is made practical for the first time through the advent of new high-wattage (1250), gold-reflector heat lamps, which employ a new type of heat-resistant glass. The lamps were developed by Sylvania Electric Products Inc.

A discussion of the merits of

Beaded and Non-beaded Boiler Tubes

T. W. REYNOLDS

A REQUEST was made that, because of the growing tendency to eliminate the beading of boiler tubes, a discussion be presented on beaded and non-beaded tubes. Personally, I believe that there will be an increased use of non-beaded tubes. There are many contrary beliefs, largely theoretical in my opinion. I have never found one who reported leakage due to non-beading. Even though non-beading is economical, it certainly seems unlikely that the few well known boiler companies who have changed over to non-beading would jeopardize their sales if the move was only an experimental one, or if there were not enough operating data.

While most of the larger boiler manufacturers still bead their tubes, there seems to be an absence of positive opinions on the subject. Perhaps shortly they may all decide that beading is no longer necessary on residential boilers. Beading is costly and competition makes one cost conscious. Although a manufacturer may hesitate to make any change-over because it is expensive to upset existing shop practice, once any change is made, it would be equally as costly to return to the old method.

Beading presents a nice appearance when the front door of a boiler is opened. A properly beaded set of tubes gives the impression of honest, skillful and experienced boiler manufacture and creates sales appeal. Some boilers are beaded only in the front. In certain boilers that are designed for gases to enter at the rear, this places non-beaded tubes where beaded tubes are said to be most necessary to provide minimum draft loss at tube entry.

Draft Loss

In this connection, one correspondent wrote, "One important reason for beading tubes relates to draft loss. This is a major item in old houses where draft losses of chimneys are greatest due to leakage, insufficient height, shape or area of chimney. Therefore, it is important that the draft loss through a boiler be reduced to a minimum. In a fire tube boiler a large per cent of the boiler draft loss takes place at the entrance to the tubes—in fact, in small and medium size boilers, not fitted with deflectors, the draft loss at tube entrance is such a large proportion of the total boiler draft loss that it frequently is the only factor taken into consideration when calculating the draft loss of such boilers.

"In Fan Engineering, fifth edition, published by the Buffalo Forge Company, figures are given on pages 131 and 132 relating to entrance losses to pipes. This reference states the pressure loss for a bell mouth or round edge entrance is .05 times the velocity head and that this loss may be neglected for ordinary ventilating work. For the re-entrant or plain open end pipe, the loss is from 0.85 to 0.95 velocity pressure. It is further noted that this type of entrance should be avoided wherever possible. These entrance losses are equivalent to a beaded and non-beaded tube, respectively."

In reviewing these figures representing each type of entrance, it seems that the first figure referred to by the correspondent is much more rounded than is the practice for a beaded tube. The second figure is not typical for a non-beaded tube. Perhaps I may be mistaken. Such a tube is slightly expanded and may project only ¼ to ⅜ inch beyond the tube sheet. While books give different values, they do support the fact that a non-beaded tube is more resistant. A former boiler engineer also advises that he believes the difference in resistance is negligible.

It is interesting that a non-beaded tube is more resistant and forms a large per cent of the boiler draft loss in the small size of fire tube boilers. One familiar with cast iron boilers commonly thinks of the draft as dependent upon the number of passes through the boilers. Therefore, it is harder to conceive of tube entry giving enough turbulent gas flow in a steel boiler to be of any consequence in draft losses.

One large boiler company beads both ends of its tubes, but only in residential sizes up to about 3,000 sq ft of SBI net rating. Larger boilers are usually beaded because boiler inspectors follow long-standing rules and therefore want beading. Commercial boilers in New York City must be beaded. Our grandfathers grew up with the locomotive type boiler and attendant conditions where fusible plugs and high and low water alarms were used. These are still used in some cases.

Opinions of Engineers

Some engineers believe that (1) beading was practiced to increase the holding power of the tube, and (2) that low pressure boiler tubes do not require beading because their holding power need be less than in a high pressure boiler. However, tests conducted by various investigators show that irrespective whether tubes are or are not beaded, they have practically the same holding power. Neither type reinforces the tube sheet nor strains the tube sheet.

One of the chief reasons given for the beading of tubes relates to the danger of burning and fire cracks at non-beaded tube ends. These ends are only about 1/10 to 1/8 inch thick. When they are extended out beyond the tube sheet for even a relatively short distance they may become red hot, it is said, and either crack or scale at these points. If the cracks extend beyond the outside face of the tube sheet, they could cause leaks.

Beading was used originally to protect the tube end. Today we have boilers with fins and other things projecting into the hot gas stream. One should recognize, however, that the non-beaded extension is different from a fin because the contact between the tube and tube sheet is made by rolling and may, therefore, be not as good a heat conductor as one of welded or integral construction. Haven & Swett in "Design of Steam Boilers and Pressure Vessels," second edition, page 192, state "the action of fire on the projecting edge of the tube is very severe and soon burns it away. Hence, the tubes are almost always subjected to the further operation of beading." As opposed to this, repair men who work on all types of boilers tell me they do not find the ends of non-beaded tubes burned off or cracked, or the cause of leakage.

Some believe the slight flare of a non-beaded tube and its slight extension may provide some tendency to collect carbon. However, if the tubes become as hot as reported, they cannot collect carbon. Others claim that with boilers carelessly operated with a low water line, it is possible that a tube might shrink away from the sheet.

Seeing a boiler with tubes beaded in the shop gives one an appreciation of the time required for the work, particularly if there are 150 tubes in the boiler requiring 300 beads. Since this is all done by hand and labor costs are high, boiler makers do not like the time required. It takes as long to bead a tube as it does to roll it. Non-beading saves about one-third the time.

Beading in the field is an even more costly process and competition is keener than in the shop. To bead in the field, the repair man must bring an air compressor, or else laboriously bead by hand. He must roll, bead, then make a slight re-roll as an added precaution. He seldom has the proper equipment, experience and facilities to re-bead and do as good a job as the manufacturer orginally did at the plant. Therefore, he may only go through the motions of beading. If a straight roll expander is used for a non-beaded tube, the tube will have no flare; a combination rolling and flaring process expands the tube at 45 deg ready to accept a bead. It does two operations in one.

Beadless tubes are not necessarily more easily removed from a boiler in the field. If removal is done right, it actually takes longer to remove a beaded tube than one without a bead.

Life of Tubes

It is difficult to say how much longer a beaded tube lasts. Apparently, they are not put to a full comparative test since the tubes fail quickly due to many other conditions. For example, a breathing type of steam heating system is bad on tubes. Air is intermittently returned and reabsorbed in the water of such a system. Even with vacuum type air valves, air may return due to valves which are old and need replacement. Old air valves blow out a lot of steam vapors, requiring, in some cases, daily make-up of water. This brings in a lot of air with the water and lessens the value of any compound put in the boiler. The life of the tubes does not seem to depend upon whether the tubes are of charcoal iron or are extra strong. While I do not know whether a tube of stainless steel could be beaded or non-beaded, no doubt it would cost too much. Some believe the life is reduced by the many scratches found through too frequent cleaning of tubes.

However, the tubes invariably fail from the outside and usually along the top where corrosive air bubbles like to hang out.

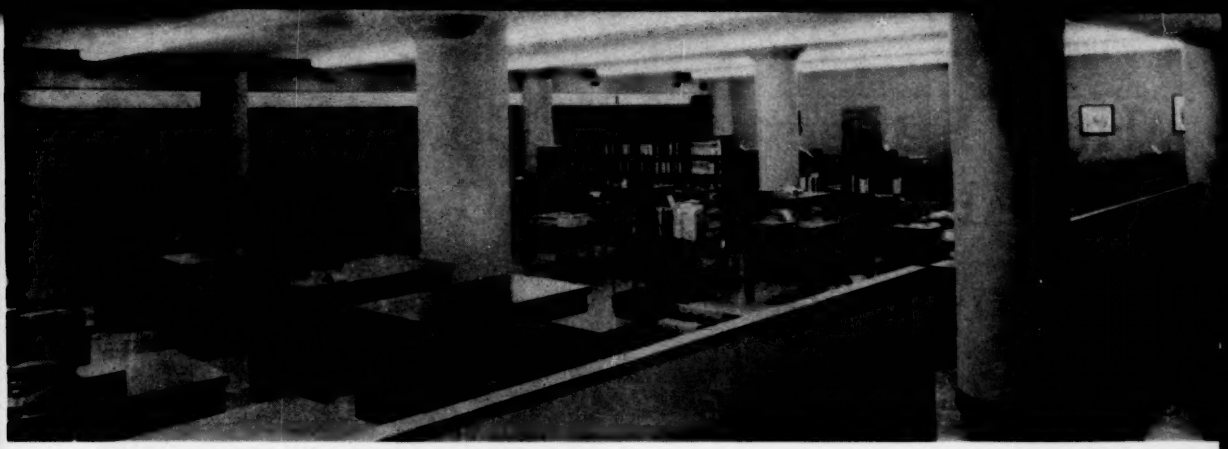
One large boiler company has not beaded its tubes for the past 20 years. Furthermore, boiler repair men have not been beading in the field for many years. Non-beading is, after all, far from being something new. Beading seems to be largely a matter of better appearance.

In this discussion I have tried to present all viewpoints. While the points against non-beading are strong, to me they appear theoretical, since they are not backed up by evidence of defects found in the field.

Bacteria-Free Air for Package Room

A bacteria- and dust-free room was provided in the plant of the Shionogi Pharmaceutical Co. of Osaka, Japan, to package pharmaceutical products. A battery of germicidal lamps and a Trion electrostatic air filter were installed. Before employees enter this room, they are required to change from street clothes to special uniforms. Air passes from the blower through an air washer to the filter and then through ducts to the air outlets.

Special measures are used to obtain bacteria-free room in Japanese pharmaceutical plant.



Factory Building Converted to Air Conditioned Ad Agency

Converting a 31-year-old building, once used by Army Quartermaster and later for manufacturing, into a sleek, ultra-modern air conditioned Midwestern headquarters for one of the nation's top advertising agencies was an interesting task. The story of how the conversion was made is told by W. F. Switzer of Frigidaire.

WHEN Foote, Cone & Belding advertising agency acquired the property at 155 East Superior Street, Chicago, as the site for its Chicago office, the structure was only a rectangular brick shell enclosing six concrete floors, supported by rows of massive pillars. The structure was originally erected by the Army Quartermaster during World War I. Later, the building was used by a chemical equipment company for light manufacturing.

One of the most serious problems was that of providing proper year-round temperature and humidity conditions. The building, including the basement, contains about 105,000 sq ft of floor space without courtyard or air shafts. There are 147 individual offices, each of about 140 sq ft, together with a score of larger work areas, for about 420 employees. There are nine conference rooms, seating from six to 20. In addition, there is an auditorium on the first floor which will seat up to 225 persons. It can be split into two or three smaller rooms by folding doors.

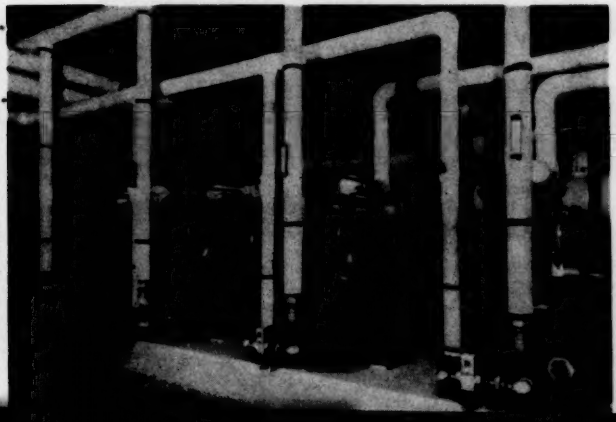
The necessary 200 tons of refrigeration is provided by eight separate 25-hp water-cooled compressors. Each individual compressor operates only when the air conditioning load demands additional capacity. Operating economy is further heightened by zoning—by floors and within each floor. Zones not in use can be shut off at a central control panel.

Pumped up to a penthouse on the roof of the building, chilled water is circulated in summer through coils which cool electronically filtered air. During winter months, hot water is pumped through the pipes for heating.

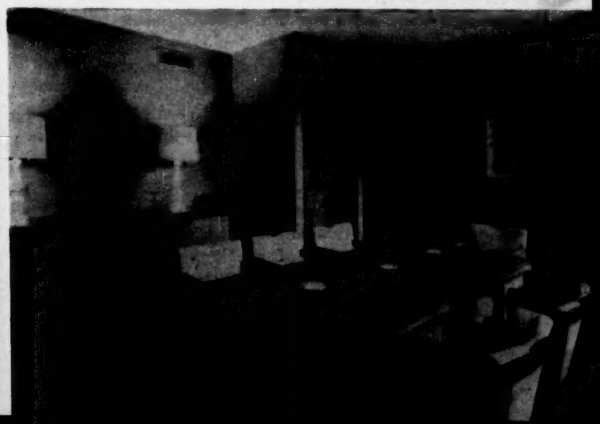
Air, either warmed or cooled, depending upon the season, is forced through nearly two miles of ducts to each office or working space and expelled through door louvers into the corridors to a central exhaust duct. Nearly all windows are double panes of fixed glass.

The system has 125 automatic control instruments, including room thermostats, humidistats, relays, dampers and motors, zone control panel and master control board for central operation.

(Below) A battery of eight 25-hp Frigidaire compressors gives flexibility to zoned 200 ton, central air conditioning system.



(Below) One of nine conference rooms in Foote, Cone & Belding advertising agency building, with supply grilles high on wall.



Heat Reflected and Conserved by Aluminum Paint Coatings

G. M. BABCOCK and F. B. RETHWISCH
Pigments Division, Reynolds Metals Co., Louisville, Ky.

Here is a concise presentation on the value of protective coatings of aluminum paint as a medium for heat reflection and heat conservation.

ALUMINUM paints are composed of a vehicle or liquid carrier and a leafing aluminum flake, so formulated and combined that upon application by brush or air spray the particles will float toward the exposed surface to form on and near the surface, a layer of overlapping aluminum flakes. This arrangement of the flakes in overlapping layers is very similar to the mat formed on the ground from falling leaves.

While each aluminum vehicle must be prepared to meet the requirements of each special application, there are certain general characteristics which must be observed. All good leafing aluminum paint vehicles are adjusted to give smooth brushing characteristics, correct drying and high leafing values for the aluminum pigment used. For outside work, long oil varnishes or their equivalent are favored, because of their greater resistance to weather and temperature changes. For inside work, where not exposed to the weather, varnish vehicles of lower oil length may be used successfully.

The correct selection of the aluminum pigment for heat reflective use is of utmost importance. Polished aluminum foil in one continuous sheet provides the most efficient type of aluminum heat reflective surface, and considerable quantities of such foil are used for this purpose. Where aluminium paint is preferred, pigment selection should be based on obtaining one with the largest flake type aluminum pigment which can be used.

It is very difficult in some cases to prove, without the use of instruments, that coarse finish aluminum coatings will reflect more heat than will extremely fine pigmented coatings which are smooth and closely resemble a foil surface. As an example of the heat reflective characteristics of aluminum paints made with various grades of aluminum pigment, the following two series of tests will amply demonstrate the greater effectiveness of the coarser grades as compared to the finer grades.

The use of aluminum paints and coatings to reflect solar heat from the exterior surfaces of buildings and tanks is now so much in general use that the contributing factors are not generally considered from the viewpoint of other equally important uses where heat reflection or conservation is required. The fast expanding use of aluminum roof coatings, combination of selected asphalts and highly reflective aluminum pigments, is indicative of many other uses.

In summer the usual black finish roofs found on farm buildings and industrial plants, absorb solar heat and this results in high under-roof temperatures. In brooder houses these temperatures may reach such a critical point as to cause the loss of many young chickens. On the other hand, the use of heat reflective aluminum coatings decreases losses from heat.

Report on Poultry Buildings

An excerpt from a report of the University of Maryland College of Agriculture-Extension Service may well supplement this.

"The specialist has reported on field tests conducted during the heat wave and states that two practices proved most valuable. They are: (1) providing cross ventilation by putting openings at the rear of the poultry house and (2) by using aluminum roofing or coating the roof with aluminum paint. By way of explanation, he reveals that his tests with aluminum roofing have shown heat waves of sunlight are reflected to such an extent that building interiors remain up to 6F cooler at bird level and up to 15F cooler at ceiling level. The use of aluminum paint made from three to four degrees difference when compared with types of roofing other than aluminum. . .

"The use of this roofing material (built-up embossed aluminum roofing) under coverage conditions of con-

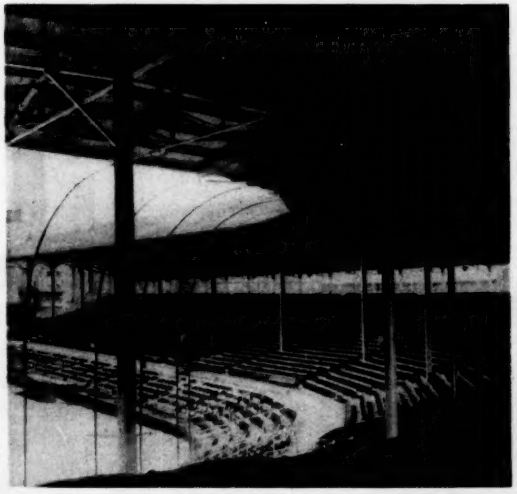


Fig. 1. Aluminum paint on the roof of Parking Field Ballpark, Louisville, Ky., is credited with reducing heat radiated from the roof structure.

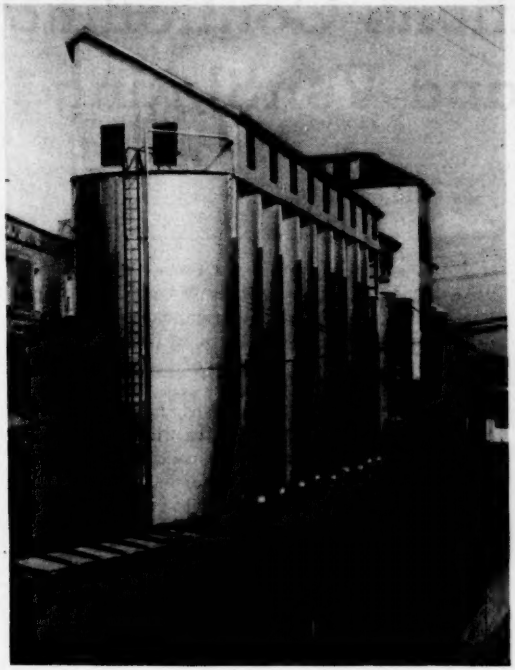


Fig. 2. Aluminum paint on steel grain-storage bins has kept contents at a much lower temperature.

struction and cross ventilation will reduce the interior temperature of poultry buildings approximately as given in Table 1."

Further light may be shed on this question of reflectivity by readings from another source. In this case, a section of an asphalt roof was taken for test. Half of the section was uncoated and the other half was coated with aluminum paint. The temperature just under the surface of these two sections was read simultaneously. The readings recorded in F deg are the average of six different daily observations.

Sun temperature	91.2
Shade temperature	88.6
Uncoated section	127.2
Aluminum paint-coated section	111.0

These readings show that the aluminum paint-coated asphalt roof does not get as hot as the uncoated asphalt roof and explains the 15F difference in temperature

TABLE 1—TEMPERATURE REDUCTION IN POULTRY HOUSES.

Air Temperature in Shade, F Deg	Reduction of Temperature in Aluminum Insulated Pens in Comparison with Non-insulated Pens, F Deg
70 - 80	2
80 - 90	2 - 5
90 - 100	5 - 6

TABLE 2—RELATIVE EMISSIVITY RATINGS FOR PAINT FILMS.

Paint Film	Time in Hours for Thermometer Readings to Register the Same
Flat black	3½
Gloss black	4
Flat white	4
Non-leafing aluminum	4
Coarse leafing aluminum	5½
Fine leafing aluminum	5½

at ceiling level noted in the University of Maryland report.

A little publicized but very important characteristic of such coatings is in the conservation of internal heat due to the low emissivity of aluminum surfaces.

Test for Emissivity

A very simple experiment to show the relative emissivity ratings of different paint films may be easily conducted. Take an ordinary friction top tin can and fit the top with a thermometer so that the bulb of the thermometer extends about a third of the way into the can. Fasten another thermometer to the lid with tape so that it is in a horizontal position and will record the temperature of the surface of the lid. The can itself, bottom, sides and top, is coated with the paint in question. Water is brought to boiling in a separate container and then poured immediately into the test can. The lid is then fastened tightly and the two temperatures noted. These temperature readings are taken over a period of time and the lapse of time noted for both thermometers to register the same temperature. The results obtained on one such test are given in Table 2.

It shows that a container having a leafing aluminum finish will exhibit heat retention of the contents over a longer period of time than will a container coated with an ordinary paint. On the other hand, the ordinary paint has about the same effect as a non-leafing aluminum paint. Leafing aluminum paint, therefore, is said to show lower emissivity than ordinary paints.

Thus a tank or structure heated from an internal source to a temperature higher than surrounding atmosphere, will lose less of this heat when coated with a leafing aluminum finish. This is further verified by a subsequent reduction in the amount of fuel used if the paint film is changed to a leafing aluminum film. Heating equipment, such as boilers, pipes and heat exchangers, will operate at high efficiency and with more comfort to individuals working in the areas where the equipment is located if they are painted with aluminum. While these uses are most apparent in commercial enterprises, similar application in homes, barns and farm buildings are proving most worth while.

Examples of some applications are: the coating of steam and hot air heating systems and porch roofs. Even garbage cans coated with aluminum paint stay much cooler when exposed to the hot summer sun, thus retarding the decay of their contents.

Laws and Regulations Controlling School Heating and Ventilating

NATHAN N. WOLPERT
Associate Editor, Heating and Ventilating

Here is Part 1 of a group of articles covering state laws and regulations drafted to govern the proper design and installation of heating and ventilating systems in schools.

SCHOOLS range from the simple one- or two-room building common in rural communities, affectionately referred to as "the little red schoolhouse," to the more extensive two-story structure found in medium and large size municipalities. Regardless of building size, regulations have been established by some state division to govern the design and installation of heating and ventilating systems.

These measures vary from those governing the installation of the simple jacketed stove for heating individual rooms in rural schools, to the design and installation of more complex central systems for larger schools. For ventilation, they progress from the simple system that relies on the entrance of fresh, outside air through open windows, to mechanical systems with their fans, ducts and vents.

Such laws and regulations are different in each state and show the influence of climate, intensity of population, the type of instruction provided in the building, and the extent of community activities held after school hours. However, there are many factors that are common to several states. The State Department of Education or a similar state division may pass on plans and specifications as a check that all of the state regulations will be followed regarding school heating and ventilating. Some leeway is provided so that special cases can be given special consideration.

In this study of state regulations, some states are missing. This omission is not through oversight but marks the result of several unsuccessful attempts to obtain the necessary information.

Alabama

There are no state laws nor State Board of Education regulations governing the heating and ventilating of school buildings. However, architects at the State Board of Education review individual building plans and approve or disapprove proposed facilities for heating and ventilating.

Arizona

Regulations for the heating and ventilating of schools were drawn by the State Department of Health to follow the standards of the ASHVE.

Under severe winter conditions, the heating system must be of sufficient size to properly heat and ventilate the building and to maintain a room temperature of 70F without forcing the system. Whatever heating is installed must conform to the standards of the National Board of Fire Underwriters, while gas appliances installed must bear the approval of the American Gas Association Testing Laboratory.

Ventilation is to be so controlled that there will be no objectionable air currents on the students. Mechanical air conditioning units, equipped with filters, are to be designed to provide a minimum of 30 cfm per occupant, including 10 cfm that is to be taken from an outside source. Evaporative type coolers shall be large enough to insure a complete air change every 3 minutes.

Arkansas

The state does not have laws governing the heating and ventilating of schools.

California

The State Department of Education follows the rather sketchy ventilation regulations published in the Uniform Guide of the Pacific Coast Building Officials Conference.

The only regulations regarding ventilation in schools are the rather sketchy ones found in the Uniform Building Code of the Pacific Coast Building Officials Conference. This states that windows or skylights shall be not less than one-eighth of the total floor area or that the school shall be provided with a mechanically operated ventilating system supplying at least 30 cfm.

While in most areas of California window ventilation is used, in most auditoriums or units that have large seating capacities, forced ventilation is coming to be the means for supplying ventilation.

In some parts of California there are winter conditions very similar to eastern areas and it is believed that such areas should have some form of forced ventilation in which the air is tempered for comfort.

Colorado

The state does not have laws or regulations covering the design or installation of heating and ventilating systems in school buildings. It does have regulations concerning the inspection of school buildings which comes under the Department of Factory Inspection.

Connecticut

The Connecticut State Department of Education issued last year the Public School Building Guide Including Standards for Approval, from which these regulations are taken.

TABLE 1—VELOCITIES FOR DUCT DESIGN

Item	Max. Velocity, FPM
Fan—individual ducts	500
Gravity*—15 ft or less rise	200
15 to 30 ft rise	250
30 to 40 ft rise	300

*Where permitted.

Ordinary warm air systems are not considered desirable for any but one- or two-room schools. High pressure steam systems are not generally acceptable in this state. Systems that recirculate air between classrooms or provide long runs of air supply ducts may be approved when they are considered necessary because of dusty or smoky locations.

While an air supply of 10 cfm per person is recommended for laboratories (exclusive of fume hoods), classrooms, libraries, auditoriums and all rooms for which the occupancy can be readily estimated, the recommended figure is 15 cfm per person. The supply of air to toilet rooms, locker and dressing rooms, cloak rooms, kitchens and food laboratories should be sufficient to provide 6 complete air changes per hour. However, in some rooms, as auditoriums, which have a positive supply of warmed fresh air, these requirements can be varied to meet special conditions. Variable fan speeds are recommended for systems that serve auditoriums and gymnasiums that have space for spectators.

The rooms that are occupied by pupils should be maintained at 70F and served by the air changes mentioned. However, locker and dressing rooms are to be kept at 75F, and corridors, gymnasiums and shops at 65F because of body activity.

Boilers, which are sized according to the recommendations of the ASHVE, should be large enough to keep the building at the minimum temperature of 70F when the outdoor temperature is 0F. The boilers should have moderate reserve capacity to care for moderate future additional loads. In fact, the entire heating system should be so designed and vent ducts so installed as to provide for possible changes and additions due to building expansion. Trunk lines and ducts cannot be exposed in rooms, passageways, or in the main corridors used by pupils.

Where radiators are installed, they are to be placed beneath windows and, as far as possible, extend the full width of the window sash above. As an aid when cleaning, exposed radiators are to be of the wall type and hung from the walls. Radiator shields are recommended for the protection of nearby occupants.

Unit ventilators may be used as part of a heating and ventilating system, but for large windows, use of auxiliary heating units is recommended to compensate for excessive heat loss due to the windows and also to supply heat when the building is not occupied.

Both heater and fuel rooms are to be of fire resistive construction. The state recommends oil-firing because of cleanliness and also for its adaptability to automatic control. Aside from these reasons, it releases the personnel for other duties. Whatever oil-burning equipment is installed must have the approval of the National Board of Fire Underwriters and must be installed to meet the requirements of the state building code. Stokers may be installed providing the equipment and installation is in accordance with the same code.

Panel or radiant heating may be used providing the installation is in accordance with the latest practices recommended by the ASHVE.

The heating system shall be automatic, wherever possible, and controls provided to make it flexible. Individual room controls are considered highly desirable. Parts of the building, such as auditoriums and gymnasiums which may be used outside of the regular school hours are to be zoned to enable the heating and ventilating to be regulated and operated independently of the rest of the building.

Ventilation by windows alone is not considered practicable and such a system will not be approved. A mechanical ventilating system is recommended; the State Department of Education, at its discretion, may require such a system. Fans must be quiet in operation. A separate ventilating system is required to serve toilets.

With the exception of corridors and stair halls, ducts shall be installed to exhaust the air from rooms used by pupils. The state does not favor systems with ducts or shafts that exhaust into attic space.

Attention is given to cloakrooms, wardrobes and lockers for the storage of pupils' clothing. While ventilation shall be provided for cloakrooms adjoining classrooms, it is permissible to exhaust the classroom air through the cloakroom provided that there are the required number of air changes. Ducts are to be installed to ventilate wardrobes and lockers. Classrooms may rely on wardrobe ventilation if the wardrobe vent openings are not less than 20% larger than the required size for the classroom. Ventilation for corridor lockers is not recommended.

Suitable ventilation is required at or near the sources of objectionable odors and fumes such as those that may develop in laboratories, shops and kitchens. In addition to general ventilation, the chemistry laboratories are to have fume hoods of acid-resisting construction, and provided with positive ventilation. Special exhaust provisions should be installed for the shop forge, internal combustion engine repair, and welding operation. In addition, there should be special ventilation and fire prevention measures for spray painting.

Vent grilles should be installed on walls at the floor lines, and as far as possible from the windows. Although a great deal depends upon the type of ventilation employed; in general, with gravity exhaust systems, grilles should be placed near the ceiling. However, ceiling grilles are acceptable only as special conditions may require them. The designer should avoid the concentration of exhaust points; at least two exhaust points should be provided in the average classroom, remote from each other, in addition to any wardrobe ventilation. Floor grilles are not approved.

Exhaust ducts or flues shall be of incombustible materials and construction, continuous from grilles to

points of exhaust outside of the building. Corridor ventilation will not be approved. Approval of duct sizes shall be based on velocities in Table 1.

Where practicable, vent ducts and shafts should be equipped with automatic dampers to conserve heat and to prevent back drafts.

Exhaust fans located in places inconvenient of access, should, unless otherwise approved, be controlled by pilot light switches in the custodian's room, the principal's office or both. Convenience for the principal is preferred.

Exhaust openings should be protected from the weather and against back drafts by ventilator caps, heads or other approved devices. Points of exhaust for gravity systems should not be lower than any adjacent copings or other raised portions of roofs. Attic spaces should have openings sufficient to allow a free circulation of fresh air. Ventilation should be provided for the boiler rooms.

Delaware

The following information is from the regulations of the State Board of Education.

Heating and ventilating systems should be so designed that during the heating season and under the most severe local winter conditions, the temperatures listed in Table 2 will exist.

These design operative temperature readings are to be taken 5 ft above the floor, and the maximum air temperature gradient from the floor to a point 5 ft above the floor is not to exceed 5F.

School buildings that have 3 classrooms or less may be heated by stoves placed in individual classrooms.

The regulations state the ventilating systems shall provide, and heating systems shall allow, for the introduction of outside air so that in all rooms planned for close assembly, there shall be a minimum of 10 cfm outdoor air per occupant. For effective operation, however, the outdoor air supply should be large enough to prevent overheating. In occupied zones, air movement is not to exceed 30 linear feet per minute.

The ventilation system for main toilet rooms shall be independent of that for the building. Classrooms that are provided with their own toilet facilities are to be ventilated in a manner approved by the State Board of Education.

In general, where unusual or obnoxious odors may occur, as in toilets, locker rooms, chemical and food laboratories, and kitchens, there shall be at least 6 air changes per hour provided by (1) introduction of outdoor air; (2) by exhaust of room air, or a combination of both.

In schools that do not have mechanical ventilation, the vitiated air shall be removed from the room through one or more exhaust openings near the floor line in the wall, on the side of the room opposite the windows. Rooms that do not have accelerating coils in the exhaust flues, are to be served by at least two exhaust openings not less than 8 ft apart, center to center, connected with an independent exhaust flue that extends through the roof to an approved ventilator. The combined areas of the flues should not be less than 1 sq ft for each 5 room-occupants. Each flue should have a shut-off fire damper.

TABLE 2—DESIGN TEMPERATURES FOR VARIOUS ACTIVITIES

Type of Space	Design Temp., F
Sedentary activity—classrooms, auditoriums, offices and cafeterias	70
Moderate activity — corridors, stairways, shops, laboratories and kitchens	68
Vigorous activity—gymnasiums	65
Special cases—lockers and shower rooms	78
Swimming pool area	83

Florida

The following data are from the state school laws.

A central heating system, or its equivalent, as defined by regulations of the state board, is to be installed in all school buildings of 10 classrooms or more. Points south of latitude 27 do not require as much heating as do those north of that latitude and therefore the state superintendent may authorize exceptions, subject to regulations of the state board. In buildings that do not have a central heating plant, and for buildings that are south of latitude 27 for which exceptions were not granted by the state board, ventilating jacketed heaters are to be placed in individual classrooms.

The rooms that house the central heating plant and the fuel supply are to have walls, ceiling and floors of fire resistive construction. Such rooms shall have outside entrances. Where there is an inside connection with the building, a self-closing fire door should be installed, approved by the National Board of Fire Underwriters. The Department of Education is considering a revision to call for 4-hour fire resistive materials for walls, ceiling and floors. Other suggested revisions include the installation of an improved automatic fire damper in connections between ductwork and boiler or furnace room; that all top light sections of classroom windows shall be operative.

Where mechanical ventilation does not exist, then every schoolroom that is used by students must have means for cross ventilation. When windows are relied upon for ventilation, the design should permit 50% of the window area to be open at one time; two or more windows shall be provided with deflectors to protect pupils from cold air currents.

Georgia

The 1949 revision of the rules and regulations is tentative only although approved by the State Board of Education. They lack legal enforcement. It is the county rather than the State Board of Education that is given full authority for the construction of school buildings.

Tentative regulations require that the room for the central heating plant and fuel, shall have walls, ceiling and floors of fire resistive materials, and that an outside entrance shall be provided. If there is an inside entrance from this room to the building, it shall have a self-closing fire door approved by the National Board

of Fire Underwriters. There shall be means for easy removal of ashes from the heating plant.

In all buildings, not provided with a central heating plant, it is recommended that each classroom shall be equipped with a ventilating jacketed heater. No installation shall be made of space heaters which burn carbonaceous fuel unless provision is made to supply an adequate intake of fresh air to replace the oxygen consumed by the heaters. Such heaters must be adequately vented to the outside to remove all products of combustion.

Where mechanical ventilation is not provided, every schoolroom used by students shall have means for cross ventilation. When windows are used for ventilation, they shall be of such design that at least 50% of their area may be opened at one time, and two or more windows per classroom shall have deflectors to protect pupils from currents of cold air.

Idaho

The State Board of Education adopted its regulations in 1940 and they are now considered to be in need of revision.

All heating plants for one-story buildings must be surrounded with fire resisting material, and all heating plants for two-story buildings must be surrounded with fireproof material.

A jacketed stove of an approved type, providing fresh air from the outside may be used for one-, two-, and three-room schools; but if a basement is provided, a basement heating plant with a modern system of ventilation is recommended.

Schoolrooms must be provided with fresh air from the outside during classroom hours at the rate of 10 cfm for each pupil, besides window ventilation. Where warm air heating plants are used, fresh air intakes must be provided with dampers to be used only for overnight recirculation. Fresh preheated air, directly from the outside, must be provided during classroom hours. Window ventilation may be used before, after, and between classroom hours or when the furnace is not needed.

Heating systems shall be capable of maintaining a temperature of 70F when outside temperature is —20F (in northern or eastern Idaho, —30F); heaters shall receive air from outside the building. After heating, this fresh air is to be introduced into the classroom in such a way as not to create any direct draft.

If direct steam or hot water heating is used, fresh air must be admitted into classrooms, but the fresh air intakes shall be located behind or under radiators. Since this introduction of fresh air may cause freezing of radiators, unit ventilators are recommended. Direct steam or hot water heating without fresh air intakes are forbidden for classrooms but may be used in halls and office rooms. All classrooms must be provided with air vents to the outside in addition to fresh air intakes.

Toilet rooms, laboratories, shops, and similar areas where offensive odors may occur shall be ventilated independently and shall be provided with ventilating ducts of sufficient size through attic space and roof directly to the outside. All heating plants shall be controlled by thermostats.

Illinois

This state does not have laws governing the heating and ventilating of schools. Architects have done a good job in taking care of such design.

Indiana

Originally drafted by the Administrative Building Council of Indiana, the following regulations were approved and adopted in 1944 by the State Board of Education.

The total primary air circulation for the occupancies in Table 3 should not be less than 30 cfm per occupant or, stated differently, a minimum of 8 air changes (fresh air plus recirculation air) per hour. Auditoriums, gymnasiums and similar occupancies that have rooms with a ceiling height in excess of 20 ft should have 6 air changes per hour. The outside air supply should not be less than 10 cfm per occupant. Where the stage of an assembly hall has a fire curtain, sufficient air should be supplied to equalize the air pressure so that deflection of the curtain may be avoided.

Although floor registers or grilles are forbidden, air inlets that are permitted should be located and equipped to provide proper air distribution and to eliminate drafty conditions within the occupied space.

Rooms used for vocational instruction and for laboratories should have exhaust systems that are separate from all other services and systems in the building. Where the equipment or processes may create dust, fumes or gases, then exhaust ventilation shall be provided in accordance with requirements of the Indiana State Board of Health.

Special measures are taken for clothing. Ventilation shall be provided and maintained for all wardrobe, cloakrooms, lockers and locker rooms, and, where practicable, it shall be through exhaust methods. Air movement should not be less than 2 cfm per sq ft of floor area; although when the clothing lockers are in corridors, the air movement from each linear foot of locker or individual hanger space should not be less than 6 cfm. This amount of air should be deducted from the total amount of exhausted air required for proper ventilation. Additional vent flue area is to be provided for the remainder of the rooms.

Approved air filtering devices shall be installed in all mechanical heating, ventilating and air conditioning systems. Automatic temperature controls are to be placed in assembly halls, lecture halls, library reading and stack rooms, school auditoriums, class, lecture, project and study rooms, swimming pools and vocational instruction rooms.

TABLE 3—INDIANA BASIS OF SCHOOL OCCUPANCY

Use of Occupancy	Basis of Occupancy per Occupant
School auditorium	6 sq ft for seated space
Classroom	12 sq ft or 225 cu ft
Lecture room	12 sq ft
School project room	18 sq ft
Study room	16 sq ft

Experience is my Classroom

By T. W. REYNOLDS

• SECTIONS SHOW UP ERRORS

The planning stage is of great importance in a building project, and time is of the essence (at least the specifications say so). As a consequence, most everyone in the office is involved in action but few are really thinking. The result is that the drawings go quickly out to the field without details, checking, or development of sections. You ask the draftsman if he can get that nice looking duct transition in and would not a section show its possibilities or impossibilities. Now sections do show up errors, so that they must be avoided if the job has to go out at the appointed time. They are irksome to make since they require some annoying mental effort, some knowledge of other professions, such as architecture and structural engineering, together with a study of other uninteresting things which may and usually do interfere, such as lights, conduits and pipes.

The draftsman humorously replies that he shows the duct transition so nicely just for psychological effect in the hope the contractor will somehow find a way to squeeze it through, and if not the air will just have to hurry and turbulate a bit faster through a diminished and distorted area. Contractors are good at this sort of thing and the draftsman does not have to go out to the field. His job is done.

• OIL PREHEATING

The thermal-electric system for preheating oil has been used with success in many industrial oil burner installations. This system offers certain advantages where the burner is inoperative at night, or for long periods of time, and the oil in the storage tank is allowed to cool off. For example, in the heating of greenhouses there is practically no heating demand at all during the day, and then at sunset there is a sudden and full demand.

Other methods of heating oil depend largely for their success on periodic or continuous operation of the burner. In such systems there may be a troublesome temperature steam regulator and steam trap with their by-passes and condensate to waste, all of which involves piping with insulation and maintenance. Piping may be oversized to lessen resistance to the pump which pumps against a relief valve and usually is run to return the oil. Duplicate pump sets with strainers may also be installed.

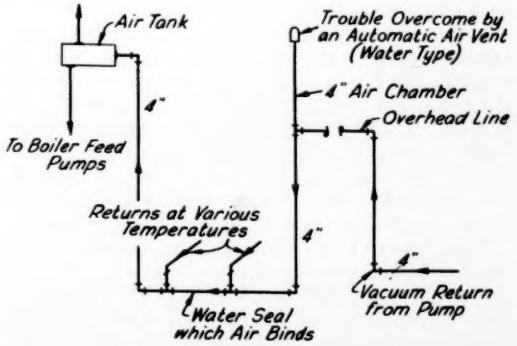
Power failure will render all electrical equipment temporarily useless, but in the thermal-electric system it will make for quick reheating of the oil. Such a system elevates and maintains the temperature of the oil in every portion of the oil piping system from suction to burner and return. This reduces the viscosity, or resistance to oil flow, so that the oil has the characteristics of light flowing oil.

• TRAPPED AIR CAUSES VIBRATION

The case of a pump return line which hammered and vibrated was recently brought to my attention. I have met the problem before and the cause is usually attributed to the pump. The overhead line (see illustration) swung back and forth rather violently, but this was not the fault of the pump. It was simply due to air binding in the low portion of the run which remained sealed with water, whether or not the pump was running.

Pockets of air trapped in the water seal expand as the pump brings new water along. These pockets contract or are eliminated as the air or steam condenses and brings the separated water together again. Likewise, the water slugs in the column line are abruptly stopped as they meet an air pocket. The result is water hammer, excessive swinging of the line, and chattering of the valves at the pump.

The remedy is shown in the illustration and consists of a simple air chamber of ample pipe size and height suitable to the pump pressure. This pipe should be terminated with an automatic air vent of the water type.



Return line which vibrates and air binds.

Fire Safety Measures for

Air Conditioning Systems

P. C. HENSLER
Fire Protection Institute, New York, N. Y.

A duct system installed to supply conditioned air, can, during a fire, promote the rapid spread of flames and smoke through the zones served. Fire safety precautions that are made part of the design, installation and operation of air conditioning systems, help safeguard the building.

AIR conditioning systems have certain potential fire hazards that can adversely affect the degree of fire safety of a building in which they are housed. Any duct system for the movement of air can become a tool for spreading fire and smoke through the building or area which it serves.

Fresh air intakes outside the building and return intakes located inside can provide a means for fires originating outside the building to be drawn into the system and thence to spread throughout the building.

All ducts serving two or more floors should be equipped with approved fire dampers at all points where the duct passes through a fire partition and in each branch duct at its junction with the main vertical duct. Dampers are not required at room openings in the branch duct. A check on the operations of dampers should be made at least yearly.

All intakes can be provided with screens not larger than one-half inch mesh of corrosion-resistant material, to prevent the entrance into the system of combustible material and other waste. Care must be taken in locating the fresh air intake to reduce the hazard from possible fires in nearby structures. Rubbish and other waste must be removed regularly from the vicinity of these intakes.

Discharge and exhaust air openings and recirculating air intakes should be located at least 3 inches above the floor, except that protected floor inlets may be permitted under seats in theaters. When located less than 7 ft above the floor, inlet and outlet openings should be protected by an adequate grille or screen.

Duct Construction

Ducts in the air conditioning system can be constructed of iron, steel or other suitable noncombustible material. The material selected must provide structural strength and durability at least the equivalent of galvanized sheet iron or steel. It is not wise to use an attic, basement or concealed space in a building as an integral part of a duct system unless it conforms to all local fire safety requirements.

If duct linings are provided to reduce noise, or for heat insulation purposes, noncombustibles are recommended. Noncombustibles are preferred for outside duct insulation. Where air temperature is below 175F, combustible insulating material may be used if covered with ¼ inch of cement or gypsum plaster.

Standards set up by the National Fire Protection Association advise a minimum metal thickness of 26 U. S. gage for rectangular ducts up to 12 inches wide or up to 13 inches diameter. Heavier metal is advised for larger ducts, with bracing where rectangular ducts are wider than 24 inches. If ducts are large enough for a man to enter, they should have sufficient strength to permit inside cleaning or repairs on the inside and have suitable access openings.

If flexible connections are desired to prevent transmission of vibrations through the duct system, flexible woven asbestos or other approved fire-resistive material can be provided. Sleeve joints with rope asbestos packing or other approved noncombustibles are also acceptable. These requirements are not applicable to joints connecting fans where the intake or discharge of the fan is in the same room or enclosure as the joint.

When installed, fans should be so located and arranged to afford ready access for repair, cleaning, inspection and lubrication. Each installation can be equipped with a manual emergency stop, located at a convenient spot, for quick shutting down of the fan in case of fire. Approved fire extinguishers should be conveniently located for emergency use.

In systems that recirculate the air and serve more than one story of a building, or more than one fire section of a single story, fans can be arranged to shut down automatically when the temperature of the air in the system becomes excessive, as from fire. An approved thermostatic device with a setting not in excess of 124F can be placed in the system at a suitable point in the return air duct ahead of the fresh air intake.

Air Filters

Air filters must be of approved types; they must not burn freely or emit large volumes of smoke or other objectionable products of combustion when attacked by flames. The discharge of smoke is especially serious. It is a panic hazard in buildings which may have many occupants, and house theaters, auditoriums, and department stores.

Dust accumulations should be removed at regular intervals. Unit filters can be renewed or cleaned when the resistance to air flow has increased to five times the original resistance or when it has reached a maximum of 0.5 inches water gage, whichever is higher. A suitable draft gage can be provided for this purpose.

TABLE 1—EXTINGUISHERS TO USE ON SPECIAL FIRES.

Type of Fire	Extinguisher to Use
Class A	
Wood, paper, cloth, rubbish and other combustible materials	Foam or soda acid extinguishers
Class B	
Oil, grease, paint and related products	Foam, dry chemical, vaporizing liquid, carbon dioxide. (Do not throw water on this type fire; it spreads the flames)
Class C	
Electrical installations, including motors and generators	Carbon dioxide, dry chemical, vaporizing liquid extinguishers. (Do not use water-type extinguisher on electrical fires)

Draft gages of the type which flash a warning light, or produce a suitable signal when excessive dust loads have accumulated, are recommended.

Electrostatic filters introduce the potential hazard of high voltage electrical equipment and careful maintenance.

Electric motors should be so located to facilitate maintenance, such as oiling of bearings and replacement of brushes. Open motors having commutators or collector rings can be protected so that sparks cannot reach nearby combustible material. Motors installed inside ducts can be provided with temperature-protection devices designed to cut off the current before the temperature is high enough to generate smoke.

In case fire should occur in electrical equipment, approved fire extinguishers should be within easy reach so that a small fire can be kept under control until the fire department arrives. The first 5 minutes of fire fighting are the most important.

Several types of fire extinguishers are available for the different classes of fires listed in Table 1. Use of a water-type extinguisher on an electrical fire may prove disastrous.

Means of detecting and controlling the spread of smoke in air conditioning systems is recommended in buildings where the panic hazard is unusual or where valuable contents are subject to smoke damage.

The National Fire Protection Association, Boston, data has been used extensively in the preparation of this article. It has published standards for the effective detection and control of smoke in air conditioning systems (NFPA Standard, No. 90, Section 201).

There are an estimated 200,000 air conditioning systems in use in the United States and Canada alone. With improved fire safety precautions incorporated in their design, installation and operation, they can continue to make the buildings in which they are installed better places in which to live and work.

Heating System for Michigan State Hospital

What is believed to be the largest radiant heating system ever installed in a hospital is that designed for the State of Michigan's new Northville State Hospital, Northville, Mich. Approximately 600,000 feet of 1-inch wrought iron pipe, more than 400 tons, were specified for this service by E. R. Little Co., engineers; O'Dell, Hewlett & Luckenbach, architects; and Adrian N. Langius, Director of the State Building Division of Michigan. In the 9-story Medical Unit, the first building to be completed, more than 100 tons, approximately 120,000 feet of pipe, were delivered for radiant heating.

The radiant heating system was designed to deliver approximately two-thirds of the necessary heat. The balance is supplied by a ventilation system taking heat from steam coils.

Five Zones in System

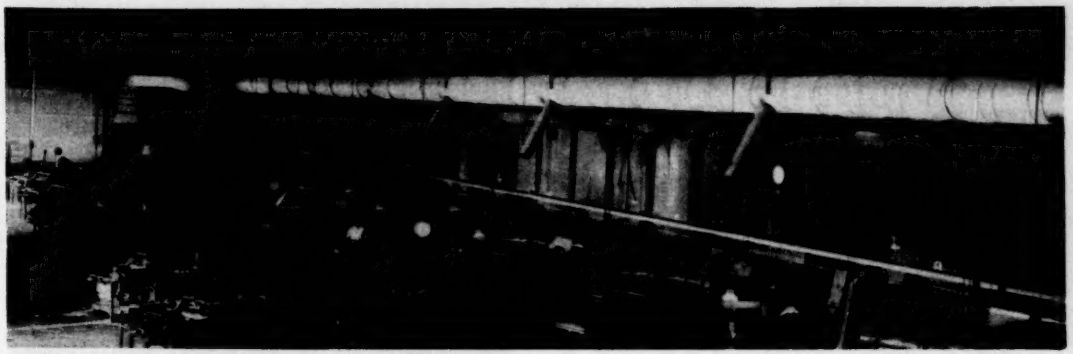
Radiant heat is controlled by means of outdoor thermostatic equipment which regulates the water temperature, and indoor zone thermostatic equipment that operates zone pumps. There are five zones in the Medical Unit, each served by a converter through which water and steam pass for heat exchange. Three other converters are provided for the ground floor, third floor surgery wing, and the top floor. Seven of these converters are located in the basement and one in the penthouse. Each converter is equipped with a modulating steam valve actuated by outdoor thermostatic equipment. Steam is supplied from a central power plant.

Each of the five zones on each floor has its own floor-zone hot water pump discharging into the return side of the vertical circulating mains. It circulates hot water from a vertical circulating main through the horizontal perimeter supply main, the headers to several radiant heat panels in the floor, and the return main. The flow of water through these serpentine panels may be controlled by manually set, locking flow-valves on the return side of each. Floor-zone pumps are controlled by floor-zone thermostats.

Ventilating Equipment

Ventilating equipment on each floor consists of a supply fan in the machinery room, and an exhaust fan in each of three main shafts. Each main supply fan is equipped with an outside air preheat steam coil and six reheat steam coils which, together, can give a temperature rise of 140F from —10 F. Air temperature is controlled by regulation of zone reheat coils.

Since only a small proportion of the total heat is supplied by the ventilation system, supply-air temperatures are relatively low. The system is designed for draftless distribution and diffusion of fresh air.



Fume hood and supply air duct over hot dip tinning machines. Heater in background supplies air through outlets at each machine.

Heating a Sheet and Plate Mill

A three-fold heating, ventilating, and moisture control problem confronting engineers who designed and built the largest cold reduction sheet and tin plate mill on the West Coast was solved by packaged, direct-fired space heaters.

THE vast, new sheet and tin plate mill at the Pittsburg, California, plant of the Columbia Steel Co., a United States Steel subsidiary, includes basic production open hearths, rolling mills, wire mills, rod mill and wire rope mill. Other facilities include an emergency hospital, a cafeteria, rest rooms, a modern chemical-metallurgical-testing laboratory, and complete storage and maintenance accommodations.

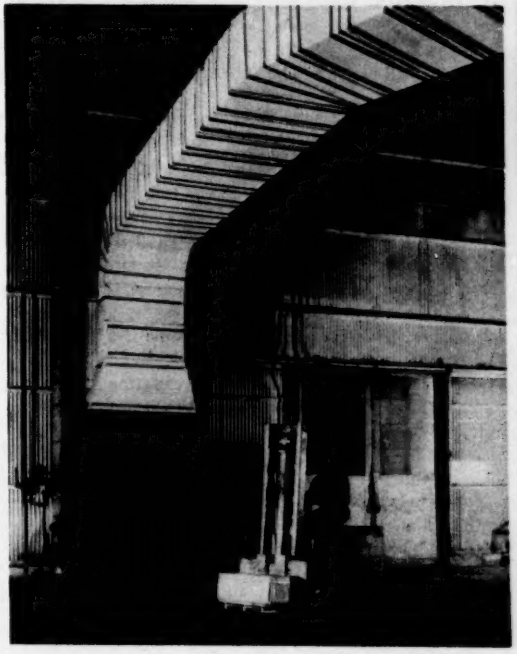
Occupying 24½ acres of floor space under one roof, the sheet and tin mill building is more than 1,600 ft long and 974 ft wide. The machinery contained in this building weighs more than 13,500 tons. Operation of the mill adds approximately 325,000 net tons annually to the supply of flat-rolled steel products made by West Coast plants for western industry.

Because Pittsburg is located in an area subject to seasonal temperature changes at the junction of the Sacramento and San Joaquin Rivers, 47 miles northeast of San Francisco, the mill's heating demand is somewhat greater in winter than the usual California weather conditions require. To this is added a condensation problem, caused by the precipitation of water droplets on cold metal surfaces from atmospheric moisture held in suspension by warmed air within the mill. Another phase of operating conditions requires removal of fumes from hot-dip tinning baths. These conditions necessitate a flexible and efficient heating and ventilating system for this modern mill.

A total of 32 Dravo Counterflo heaters was installed in various portions of the Sheet and Tin Plate Mill—21 heaters with output of 1,250,000 Btu per hour each, and 11 with output of 1,000,000 Btu per hour each. The 21 heaters of 1,250,000 Btu capacity have been in service since the mill was put into operation in October, 1948, and the other 11 were installed in 1949.

All 32 of the heaters are fired by natural gas at a pressure of five ounces at the burners, reduced from line pressure by regulators. Combustion air is taken from the main supply fans.

Dravo heaters draw in cool air at floor level through intake louvers in the lower portion of the casing at the rate of 11,000 cfm per million Btu output, temper it, then circulate it. The air temperature is raised approximately 80 degrees, then the air is distributed through directional louvered nozzles parallel to the



Direct-fired heater supplies duct in tinning department with tempered outside air.

floor, but above the workers' heads, at sufficiently high velocity—2,000 feet per minute—to evenly blanket a large area.

This method of heat distribution produces a uniform temperature at the working level without drafts, and tends to prevent the warm air from rising immediately to the roof, thereby reducing the roof heat loss.

Condensate Control

It is commonly known that warm air can carry more moisture in vapor form than can cold air. When warm air meets a cold body, particularly one of metal, the atmospheric moisture so carried is deposited in the form of droplets of condensate on the cold body. In many a steel warehouse, this condensate has caused trouble by forming rust spots on the stored metal, and steps were taken to eliminate the possibility of this happening at the Pittsburg mill. The engineers knew that this condition could be overcome by holding the temperature of the stored material within certain limits at all times.

To prevent this condensation, nine Dravo heaters are installed in the tin plate warehouse, and four each in two sheet warehouses. Certain of the heated air streams are directed downward, to heat the floor as well as the material stacked in the immediate vicinity. By the same operation, any droplets of moisture which may have formed on either the floor or the stock are evaporated and carried off by the warm air stream.

Another example of the extreme care that is taken to avoid condensation of atmospheric moisture is the treatment of boxcars which are brought in on the loading track included within the tin plate warehouse. If the outside weather is cold, the cars and the air contained therein are cold when they are first brought into the building. Both the chilled air and the boxcar material will cause condensate to form from the heated air within the building. Boxcars are therefore held on the indoor loading tracks for a period of from 12 to 24 hours before any product is packed into them for shipment to the customer.

Condensation on stored tin plate in warehouse is controlled by heater.

Tempering Make-Up Air

A Dravo heater near the end wall of the tinning room, tempers fresh make-up air drawn from out-of-doors, warms it, and blows it through a duct above the employees' heads. The warm air stream is directed downward by the duct outlets so that each employee in the area is assured of a plentiful supply of fresh air. This duct becomes progressively smaller as it extends farther away from the heating unit, providing a constant, equalized air supply from all outlets.

In the summertime the burners are turned off, and the units are used to circulate fresh air in exactly the same manner in which the heated air is distributed in the winter.

135-Year-Old Hotel Air Conditioned

It was late Wednesday morning, April 20, 1842, when a big lumbering stage coach rattled to a halt at the threshold of the Golden Lamb Hotel at Lebanon, Ohio, after a bumpy run from Cincinnati. Alighting from the coach were Charles Dickens, renowned British author, his wife and maid, on tour of a young and vigorous United States of a century past.

Of the occasion, Dickens wrote caustically into his journal: "I never discovered that the scruples of wincing landlords induce them to preserve any unusually nice balance between the quality of the fare and their scale of charges—".

Yet today, if Dickens could pay a return visit to the dining rooms of the Golden Lamb, Ohio's oldest hostelry, undoubtedly he would revise his notes. After more than 135 years of continuous operation, the dining rooms retain all of the visual atmosphere of the early-American frontier days—but diners breathe cooled air delivered by Frigidaire air conditioners. In the kitchen Frigidaire electrical refrigeration facilities help turn out savory meals.

Innkeeper Robert Jones, who purchased the Golden Lamb in 1926, like many hotel and restaurant men who face the task of air conditioning an older-type existing building, had a difficult problem to solve. In the first place, many old structures require expensive building alterations before equipment can be installed. However, in the case of the Golden Lamb, the problem was two-fold. Mr. Jones would not consider building alterations which might destroy the traditional early-American aspects of the historic old structure.

Thus, air conditioning for the main dining room and private dining room is supplied by two Frigidaire five-ton self-contained units. Both air conditioners are hidden from view and short ducts carry cool, fresh, filtered, dehumidified air to the dining areas. The main dining room which will accommodate about 60 persons is air conditioned by a unit located in an adjacent storeroom in the rear. Because of its close proximity to the conditioned space, only short ducts are needed to carry the cool air to two discharge grilles located about 10 feet above floor level on the rear wall.

Articles in Heating and Ventilating Relating to Wartime Production

MANY of the design and construction problems of World War II again face air conditioning, heating and ventilating engineers and contractors who are planning for the manufacture of merchandise during wartime restrictions or for cooperation with national defense. To be of service to the industry, the following bibliography was prepared of articles published in HEATING AND VENTILATING that have a bearing on wartime production and national defense. Technical information of that period may be found useful at this time.

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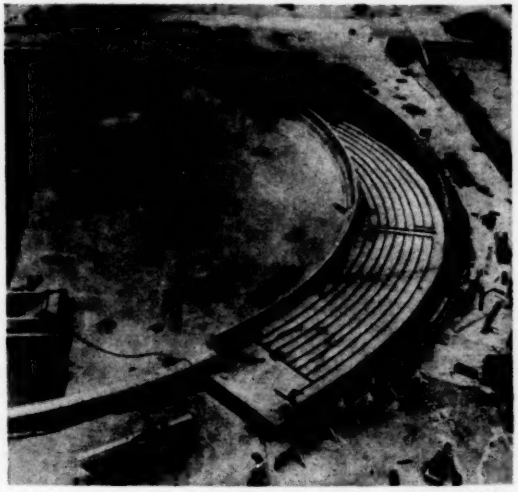


The circular concrete ramp leading down into the garage at the main entrance plaza of the United Nations Building, New York City, is being provided with a snow melting system, as are parking areas in front of buildings. Embedded coils are wrought iron pipe.

Scrapbook of Exhaust Hood Design

Part 9—Local Exhaust Ventilation in the Pottery Industry

JOHN M. KANE

Chief Engineer, Dust Control Division, American Air Filter Co., Louisville, Ky.

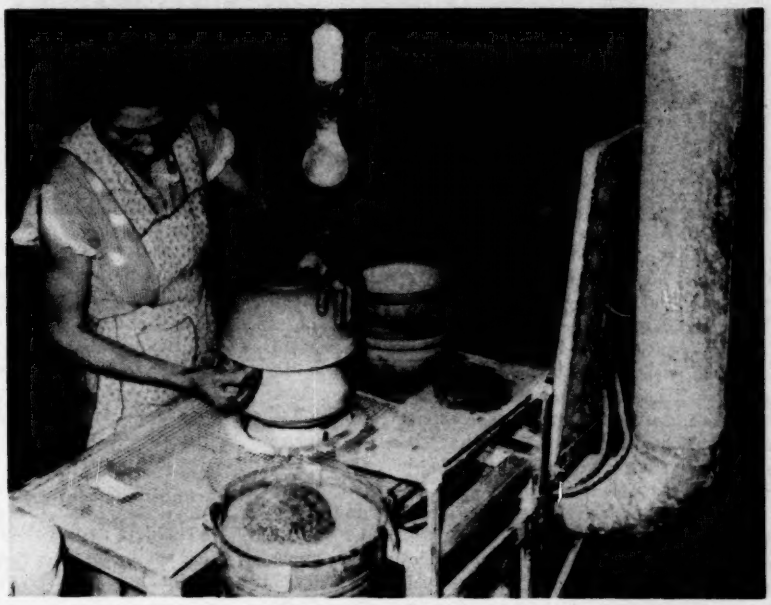


Fig. 1. Downdraft grilles trap coarse shavings and prevent dispersion of fine dust from finish fettling operations.

IN the manufacture of pottery, local exhaust ventilation is indicated for many of the finishing operations involved in this branch of the ceramic industry.

To control the fine dust and trap the coarser shavings from the finishing portion of the fettling operations, downdraft grilles, as illustrated in Fig. 1, can be easily applied. Usual exhaust volumes per station will be from 600 to 1,000 cfm, sufficient to maintain a downdraft velocity of 150 to 200 fpm over the gross table area.

Major exhaust volumes in this industry involve the ventilation of glaze spray booths. Typical spray booth construction, Fig. 2, requires indraft velocities of 125 to 175 fpm.

Fine dust is released in the finish grinding operations. One design is illustrated in Fig. 3 and another in Fig. 4. Exhaust volumes of 300 to 500 cfm per grinding wheel is ample if the exhaust hood is located near the point of dust generation. The air flow pattern is improved with the transparent front shield shown on one of the hoods in Fig. 3. In Fig. 4, it should be noted that the downdraft grille did not provide good control velocities in the zone of dust generation and the supplemental flexible duct connection was added to correct this shortcoming. Control of such operations by

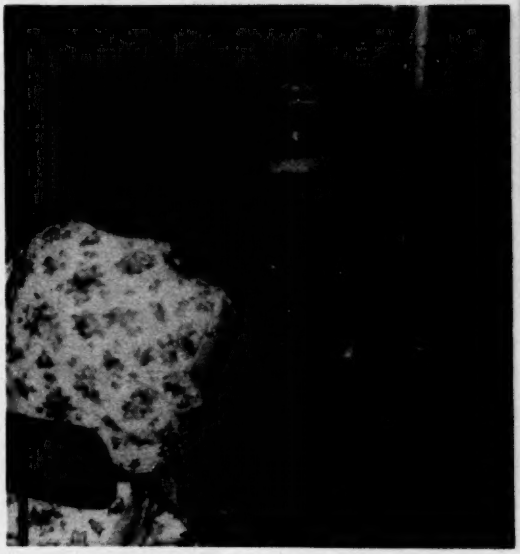


Fig. 2. Spray booths of usual construction are used for glaze spraying operations.

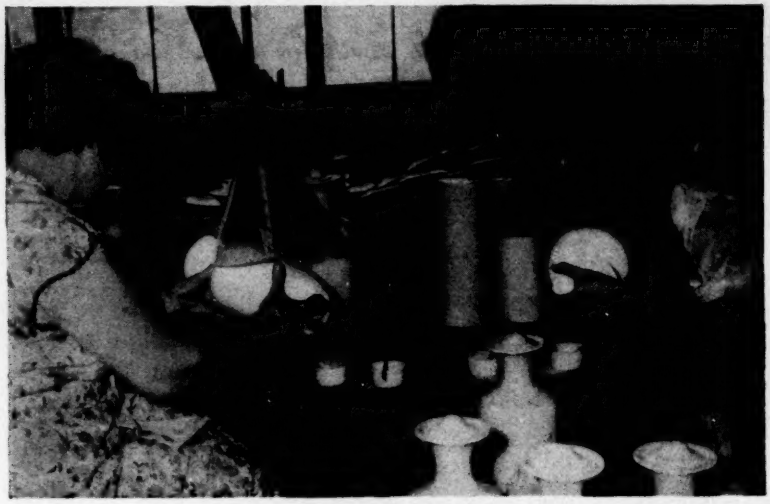


Fig. 3. Local hoods close to point of dust generation are recommended for this grinding operation. Transparent shields, where practical, will stop the throw of coarser particles toward the operator.

downdraft hoods requires appreciably greater volumes than the local hood arrangement where the latter can be located close to the point of dust generation.

Where conventional belt sanders are used (see cover) the usual enclosure and the exhaust connection at the pulley end has been supplemented with the slot type hood close to the belt edge. The exhaust of some 5% additional air through this auxiliary hood will assure maximum control and is justified where hazardous materials may be involved.

Some fine dust is released from the brushing of the finished ware. An exhaust hood for the double spindle brush, Fig. 5, was developed by enclosing the upper spindle driving mechanism. Exhaust volume of 500 cfm exhausted upward through the open bottom of the cylindrical hood provided good control.

Hydrofluoric fumes from retouching operations can be effectively exhausted by downdraft ventilation through grilles like those shown in Fig. 6. Downdraft velocities of 150 fpm will prove ample as long as the working area is not subjected to pronounced cross drafts.

Acknowledgment

The data and photographs presented in this discussion are based on a co-operative industry study made by the Industrial Hygiene Foundation, Mellon Insti-

Fig. 4. Local exhaust hoods close to point of dust generation, even where hood shape is only that of an open end duct, will require lower exhaust volumes for good contact than the downdraft grille method of ventilation.

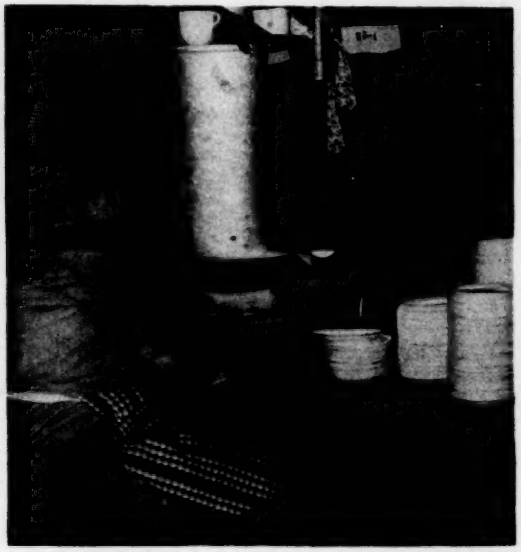


Fig. 5. Cylindrical hood for the brushing operation was developed by enclosing the upper spindle driving mechanism.

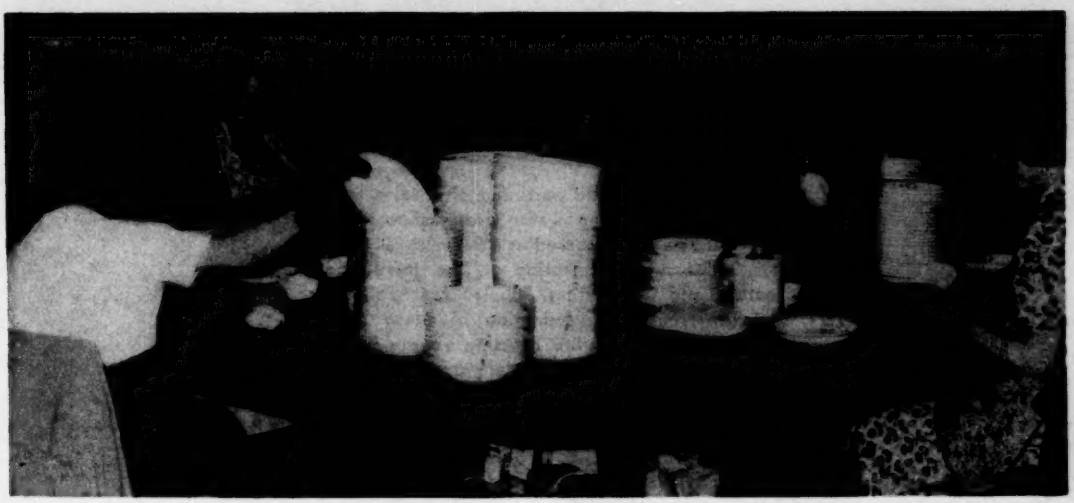


Fig. 6. Fume control for retouching operations suggest the downdraft grille approach illustrated.

tute, Pittsburgh, in co-operation with the following china companies of the East Liverpool district:

Homer Laughlin China Co. and Edwin M. Knowles China Co., Newell, W. Va.

Taylor, Smith, Taylor Co. and Harker Pottery Co., Chester, W. Va.

Hall China Co., East Liverpool, Ohio.

Sterling China Co., Wellsville, Ohio.

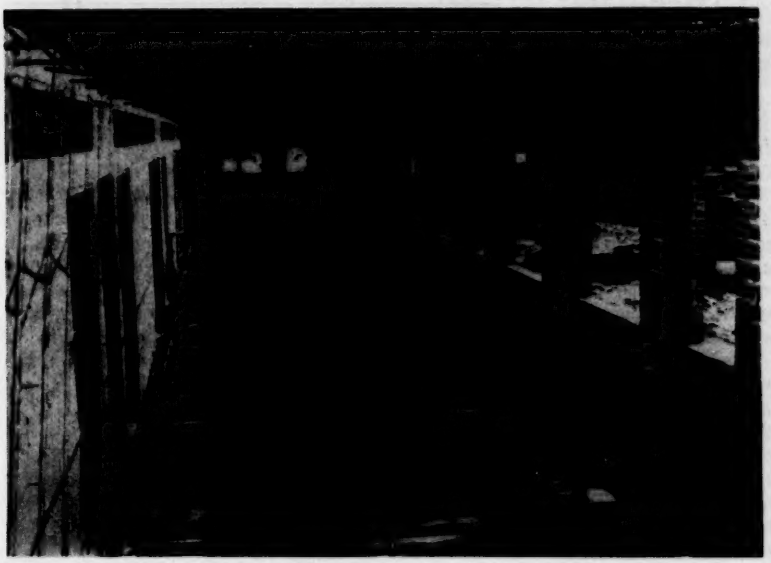
The author especially appreciates the assistance of W. C. L. Hemeon, Engineering Director, Industrial Hygiene Foundation; and Dr. Joseph T. Noe, Medical Director, The East Liverpool District Potteries.

Heating System for a County Hospital

The Chambers County Hospital at Anahuac, Texas, was designed to have a radiant heating system.

The architect, Emory S. White, and the firm of Howard, Johnson & Kelley, consulting engineers of Houston, who designed the radiant heating system, made certain that precautions were taken so that patients would not trip over any projections, to injure or burn themselves. Controls and valves were installed in a location removed from the patients' reach, so that they cannot tamper with them.

Almost 2¾ miles of wrought iron pipe were installed by Patterson Plumbing Co., mechanical contractors of Texas City, in the radiant heating system, and in hot and cold water lines throughout the Chambers County Hospital.



Installing part of the heating coils.

Heating and Cooling Media Other Than Water

The characteristics and pertinent physical properties of liquids other than water used as heating and cooling media are discussed in a paper by D. G. Lewis at a 1950 summer meeting of The Institution of Heating and Ventilating Engineers at Folkestone, England. From an examination of these physical properties the possibility of using various liquids in heating systems can be weighed. An abstract of Mr. Lewis' paper is presented with additional matter covering Socony-Vacuum heat transfer oils and tetra cresyl silicate introduced from sources mentioned in the text.

SPECIFIC gravity, viscosity, concentration, specific heat, freezing and boiling points are factors important in the consideration of the suitability of liquids other than water for heating and cooling purposes.

Some of the obvious requirements of heat transfer liquids are the ease of its handling, and its non-corrosive influence on both the carrying medium and surrounding properties. Flammability is also to be considered, as is chemical stability over the operating range. Liquids should not age over a period of time or be influenced by heat or cooling cycles. In liquids other than water, odor is a factor that must be considered. All these factors are in addition to the expected obvious factors of thermal conductivity and viscosity, freezing point and boiling point throughout the operating range.

High specific heats are desirable in that they reduce the quantity of liquid required to be circulated or stored for a given duty. On the other hand, low specific heat or low specific gravity producing a low heat content enables a quicker rate of exchange to be effected.

Brine

The introduction of certain salts into water alters the boiling and freezing point of the solution in a specific manner according to the concentration of salt. It is interesting to note that the freezing point of water is gradually lowered as salt is added up to a concentration above which the freezing point rises and may eventually be higher than that of water. The actual boiling and freezing points depend on the nature of the salt as well as the concentration of salt in the solution. Calcium chloride is a salt commonly used in brine solutions for heat transfer purposes. A 40% concentration (by weight) has a freezing point of 56F and a boiling point of 248F. At 30% concentration the freezing point is —51F and boiling point 237F. The specific gravity increases with increasing concentration. Viscosity decreases at higher temperatures and lower concentrations. At 40% concentration and 128F, viscosity is 8 centipoises. At 30% concentration and 50F, it is 4.36 centipoises. A specific heat at 30% and 50F is .655. This increases at higher temperatures and lower concentrations. When thoroughly mixed, the solution is stable and retains its density for long periods in closed circuits without need for reconcentration. Table 1 shows the boiling and freezing points of calcium chloride solutions.

TABLE 1—BOILING AND FREEZING POINTS OF CALCIUM CHLORIDE SOLUTIONS

Concentration, Per Cent, Weight	Specific Gravity at 60F	Freezing Point, F	Boiling Point, F
40	1.410	+56	248
30	1.295	—51	237
20	1.186	0	221
10	1.087	+22	214

The characteristics of calcium chloride brine are such as to make it attractive for cooling systems but less attractive for heating systems, since it would not be practicable to circulate it at temperatures much higher than maximum water temperatures at the same pressure.

Glycerine

Glycerine can be readily handled for both heating and cooling applications. In high concentrations it has a high boiling point. Both the boiling point and freezing point are lowered when glycerine is diluted with water, the freezing point reaching a minimum of —51F when the water content is about a third of the weight of solution. Table 2 shows the characteristics of aqueous solutions of glycerine.

The viscosity of glycerine and its solutions varies considerably with density and temperature. At 68F the viscosity of pure glycerine is 1,160 centipoise. Diluted to 50% with water, the viscosity falls to 6 centipoises. The specific heat of glycerine averages .665 over a range of 68F to 383F. Glycerine can be safely

TABLE 2—BOILING AND FREEZING POINTS OF AQUEOUS SOLUTIONS OF GLYCERINE

Concentration, Per Cent, Weight	Specific Gravity at 60F	Freezing Point, F	Boiling Point, F
98.2	1.261	+ 56	554
95.0	1.253	+ 46	332
90.0	1.240	+ 29	281
80.0	1.213	— 5	250
70.0	1.185	— 38	237
66.7	1.178	— 51	234
60.0	1.157	— 30	228
50.0	1.129	— 9	223
40.0	1.102	+ 4	219
30.0	1.075	+ 15	217

used with iron, steel, brass and aluminum. Concentrated glycerine exposed to the air is gradually diluted by absorption of moisture. In time it may absorb as much as 50% of its own weight.

Glycol

Ethylene glycol has some of the characteristics of glycerine. It is heavier than water, has no marked corrosive effect on iron and steel. On some other metals and alloys it has a marked corrosive effect which can be modified by inhibitors. It should not be used with zinc or galvanized iron. Characteristics of ethylene glycol solutions are shown in Table 3.

TABLE 3—BOILING AND FREEZING POINTS OF AQUEOUS SOLUTIONS OF ETHYLENE GLYCOL

Concentration, Per Cent, Volume	Specific Gravity at 60F	Freezing Point, F	Boiling Point, F
100	1.113	+ 10	386
90	1.105	— 17	288
80	1.098	— 45	260
70	1.088	— 47	245
60	1.078	— 54	235
50	1.061	— 34	229
40	1.045	— 13	225
30	1.032	+ 3.2	221

Viscosity of ethylene glycol solutions is less variable than that of glycerine. Viscosity at 75F is 17 centipoises in 100% concentration and 3 centipoises when diluted 50% by volume. Specific heat of the concentrated liquid at 68F is .575 and increases with increase of temperature as well as with dilution. At 50% concentration and 68F, it is .77.

Ethylene glycol is chemically stable and is very hygroscopic. Over a period of time it can absorb moisture from the air to an extent of 100% or more of its own concentrated weight.

Aroclor

Aroclor is a trade name applied to a group of chlorinated biphenyls. Aroclor 1248 has a boiling point of 644F and a freezing point less than 20F. Its specific heat at 86F is .29 and increases to .44 at 248F. Viscosity at 86F is 112 centipoises.

Dowtherm

Dowtherm A is a trade name of diphenyl and diphenyl oxide, produced as a heating medium at high temperature, particularly for use in saturated vapor form. It can be used freely with the common construction metals and has a scouring effect on rust or welding scale, is chemically stable over the whole range of temperature from freezing to boiling, and under pressure can be heated up to 650F without deterioration. At high temperatures, viscosity is extremely thin and the liquid is capable of seeping through what normally would be tight joints. Table 4 shows properties of Dowtherm.

TABLE 4—PHYSICAL PROPERTIES OF DOWTHERM

Boiling point		496F
Freezing point		54F
Flash point		228F
Fire point		246F
Auto-ignition temperature exceeds		932F
Viscosity, centipoises, at:	60F	5
	250F	0.8
	450F	0.4
Specific heat, at:	54F	0.37
	250F	0.47
	450F	0.6
Density, lb per cu ft, at:	54F	66.9
	250F	61.1
	450F	54.8
Heat Content, Btu per (cu ft) (F), at:	54F	24.7
	250F	28.6
	450F	32.8

Mineral Oil

Mineral oil can be used freely with all ferrous metals but at higher temperatures it may be affected by catalytic action of copper. The temperature to which oils can be raised is not related to the boiling point but to the cracking temperature of a particular grade of oil.

TABLE 5—PHYSICAL PROPERTIES OF HEAT TRANSFER OILS

Property	S/V Sovaloid S	S/V Heat Transfer Oil
Gravity, API at 60F/60F	10.0	11.0
Specific gravity at 60F/60F	1.0	.9930
Flash point, F, open cup	260 Minimum	355
Pour point, F	— 40	10
Viscosity, kinematic centistokes, at:		
450F		.86
300F		1.95
175F	1.7	8.25
100F	3.9	50.00
50F	10.0	450.00
0F	48.0	
— 10F	70.0	
Coefficient of Expansion, per deg F	.00035	
Distillation range		
Initial boiling point, F	500 Minimum	615
Final boiling point, F	640 Maximum	735 (90%)
Specific heat, Btu per (lb) (F), at:		
450F		.966
300F		.910
180F	.47	.864
100F	.43	.835
60F	.42	.820
0F	.39	

A typical grade of oil has a cracking temperature of 350F, a pour point of 10F, and a flash point, closed, of 390F. The specific heat at 200F is .427 and increases with rising temperature. Stability of oil can be maintained for a number of years, providing air is excluded and the oil is kept below cracking temperature.

A heat transfer oil developed specifically for snow melting systems by Socony-Vacuum Oil Co. is S/V Sovaioid S. This product is an adaptation of a previously marketed heat transfer oil for higher temperature applications. Characteristics of the two oils are shown in Table 5.

Tetra Aryl Silicates

This is a group of organic substances having high boiling and low melting points. By chemical combination and mixing of compounds, liquids of a common generic type but having different physical properties are produced within a liquid range of —60 to 800F. The liquids can be handled without difficulty but should be kept away from moisture or an open flame and should not be allowed to remain in contact with the skin. These liquids have an almost negligible effect on iron, steel and copper. Aluminum and its alloys should not be used.

One mixture produced for low temperature operation has a boiling point of 400F and remains fluid, although it does not flow, at —95F. Another, proposed for high temperatures, has a boiling point of 820F and a pour point at —5F, with a flash point of 400F and a fire point of 500F. Properties of tetra aryl silicates are shown in Table 6. The mixture tabulated is proposed to give stable operation over a temperature range of 0 to 600F. It has a slight phenolic odor.

TABLE 6—PROPERTIES OF TETRA ARYL SILICATES

Viscosity, centipoises, at:	0F	740.00
	50F	52.00
	300F	1.55
	600F	0.43
Specific heat, at:	50F	0.37
	300F	0.48
	600F	0.74
Density, lb per cu ft, at:	50F	72.20
	300F	65.0
	600F	56.2
Heat content, Btu per (cu ft) (F), at:	50F	26.7
	300F	31.1
	600F	41.5

Tetra Cresyl Silicates

Similar to the aryl silicates is the tetra cresyl silicate family of heat transfer liquids for higher temperature applications. Description of an application of tetra cresyl silicate in a gin still is contained in a paper by R. A. Rose delivered at a London meeting of IHVE, December 6, 1950. The liquid can be operated at working temperatures up to 715F and will stand temporary overheating to 810F. Table 7 gives some of the properties of tetra cresyl silicate.

TABLE 7—PROPERTIES OF TETRA CRESYL SILICATE

Boiling point, F	815
Specific gravity, at:	
77F	1.125
392F	.982
572F	.908
Specific heat, Btu per (lb) (F), at:	
77F	.40
392F	.530
572F	.620
Viscosity, centistokes, at:	
77F	41
392F	1.4
Coefficient of expansion, per deg F	.000775 to .000977
Density, lb per cu ft, at 60F	69.3
Flash point, F	325 minimum
Pour point, F	1.0

Mercury

Physical properties of mercury are shown in Table 8. It is the only metal which liquefies at atmospheric temperatures. It can be used with iron and steel but dissolves brass and other metals. Its vapor has a toxic effect. It is stable over the whole temperature range.

TABLE 8—PHYSICAL PROPERTIES OF MERCURY

Boiling point, F		675
Melting point, F		—38
Viscosity, centipoises, at:	—4F	1.85
	68F	1.56
	212F	1.22
	572F	0.93
Specific heat, at:	32F	0.0333
	212F	0.0326
	392F	0.0318
Density, lb per cu ft, at:	32F	845
	212F	830
	392F	816
Heat content, Btu per (cu ft) (F), at:	32F	28.2
	212F	27.0
	392F	25.9

Insulation Cuts P. O. Heating Bill

Annual savings of $1,400 in costs of heating Detroit's U. S. Post Office and Court House are expected to result from insulation of the 10th floor ceiling. Installation of Fiberglas blowing wool in the 44,000-sq ft area has been completed as part of a $130,000 modernization program started last June.

A. E. Loyal, president of Insultex Co., Detroit, the firm which installed the insulation, estimates that a savings of more than 5% on fuel costs will result.

Edmund Z. Tobola, superintendent, Public Buildings Service, said that the average yearly cost of heating the building in the last two fiscal years amounted to $26,700. On the basis of the estimate, installation of the blowing wool, which cost $4,000, will pay for itself in three years, Mr. Loyal said, and thereafter will be equivalent to an annual return of 35% on the investment. Wool was blown from a truck on the ground to the 10th floor ceiling through a 2½-inch rubber hose.

Better V-Belt Drives for Less Money

F. J. DONAHUE
Application Engineer, Allis-Chalmers Mfg. Co., Milwaukee, Wis.

MANY times it is possible to figure a drive which is much better and surprisingly less expensive than another for the same job. In other words, a first solution of a drive problem is not always the best, and it can often be improved by study and calculation. Basically, however, there is one consideration which is the key to most such improved drives. This is the matter of small sheave pitch diameter.

Flexing a rubber V-belt around a too-small pitch diameter sheave will cause excessive heating, rapid wear and early failure of the belt. Certain pitch diameters have long been recognized by the V-belt drive industry as minimums below which it is unwise to go. These minimum pitch diameters are as follows, in inches:

A belts	B belts	C belts	D belts	E belts
3.0	5.4	9.0	13.0	21.6

Further, in this regard, a study of V-belt rating tables will demonstrate that the use of small diameter sheaves penalizes a drive in two ways: First, for a given rpm, the smaller sheaves produce a lower belt speed and consequently a lower horsepower rating; second, for a given belt speed the smaller sheave produces a lower horsepower rating than a larger sheave at the same belt speed. Continuing to study the belt rating tables, it will also be noted that on small diameter sheaves there is a further penalty suffered—namely, at higher belt speeds no ratings are shown. Thus, one is subtly discouraged from using very small diameter sheaves at higher speeds. This merely reflects the fact that harmful as it is to operate very small diameter sheaves at moderate speeds, it becomes rapidly more harmful at higher speeds.

To illustrate these points in a practical way, we shall review two quite dissimilar problems from the standpoint of a run-of-the-mill, perfunctory solution; and then from the standpoint of a more carefully considered approach, deliberately avoiding too-small diameter sheaves in relation to the belt section used:

Case 1

Required a V-belt drive from a 15 hp normal torque motor at 1750 rpm to a centrifugal blower at 1272 rpm. The ratio is between 1.37 and 1.38. Without much thought, the following drive with stock sheaves and belts would probably be quoted: *Catalog 6-B46-5.4-7.4 Center Distance 13.5 inches.* According to this recent manufacturer's catalog, this drive would have a total rating of 18.2 hp and cost the user $40.48 net. Now, if we could improve the small sheave pitch diameter it would improve the drive. From the same manufacturer's catalog, we could work out a stock drive for practically the same ratio, such as: *Catalog 5-B55-6.8-9.4 Center Distance 15.4 inches.* This drive would be substantially better than the other. It would have a total rating of 22 hp and cost the user only $36.81 net. Thus, by using larger sheaves we save one belt, one groove on each sheave and still provide a larger horsepower capacity at a price some 10% lower than the drive using the smaller diameter sheaves.

Case 2

Required a V-belt drive to operate from a 100 hp wound rotor motor at 870 rpm to a centrifugal pump at 1,600 rpm. From observation, we know that some would feel compelled to use *D* section belts in this drive in view of the horsepower requirements of the job. However, in their well-intentioned and quite justified avoidance of belt speeds much beyond 5,000 fpm, they would quote something like the following drive: *Catalog 12-D173-22.0-12.0 in. center distance 60.7 inches.* It will be found that the 12.0-inch sheave was selected because it was the largest that could be used without considerably exceeding 5,000 fpm belt speed. Actually it produces 5,040 fpm. The rating table for *D* section belts shows no ratings for a 12.0-inch diameter sheave beyond 3,800 fpm indicating quite definitely the undesirability of operating *D* belts on a 12.0-inch sheave beyond 3,800 fpm. This drive would cost a user $636.34 net.

Studying such a drive with an eye to bettering it, the 12.0-inch sheave would claim our attention at once. It is a full inch smaller than the minimum generally regarded as acceptable. Yet, to select a larger sheave would be to err in the other direction; i.e., excessive belt speed. The solution is really simple. Why not retain the present sheave diameters but go to the next smaller belt section; namely, *C* section, for which the 12.0-inch diameter is generous and comfortable. This would give us a far superior drive from several standpoints: *Catalog 11-C173-22.0-12.0 inch center distance 60.5 inches* which would cost the user $283.03 net, at a saving of over $250.00, or nearly 40%. The face width of the 12-D groove sheaves would be 17 9/16 inches compared with the 11-C groove sheaves whose face width would be 11⅜ inches, or a saving in face width of over 6 inches. Frequently, compactness such as this is highly important, especially when the installation is to be made in an old plant.

These advantages are enough alone, but consider another reason for going to a smaller belt. Assuming the correct theoretical tension on a *D* belt to be 230 lb, and that for the *C* belt to be 125 lb, the 12-D belt drive would require 2,760 lb tension between shafts and the 11-C belt drive would require only 1,375 lb. The advantages of lower bearing pressures need no explaining.

These examples are given to emphasize the need of using care in selecting drives. The convenient tables worked out for the catalogs cannot take all factors into consideration. That is left to the engineer.

Abstracts AND Reviews

Publications abstracted in this department should be ordered direct from publisher.

FUELS AND COMBUSTION HANDBOOK

The engineer and others interested in the selection or use of any type of fuel, will find considerable factual information in the Fuels and Combustion Handbook, by Allen J. Johnson, consulting mechanical engineer, Lansdowne, Pa.; and George H. Auth, professor of mechanical engineering, Villanova College. It was prepared with the cooperation of a large number of authors and presents comprehensive information on the properties, characteristics and uses of solid, liquid and gaseous fuels.

Wherever possible, the authors have replaced formulas by tables and graphs, the rapid computation technique of alignment charts, and have made use of comparative tables to show advantages, disadvantages, applications, performance data and characteristics of optional equipment or methods.

New advances in the field which are covered include synthetic fuels, the heat pump, gas turbines, spreader stokers, furnace and equipment designs, etc. It is claimed that over 50% of the material presented is less than 5 years old.

The 26 chapters of the book are divided into the following 8 sections: solid fuels; liquid and gaseous fuels, and miscellaneous sources of heat and power; combustion; selection of a fuel; preparation of fuel for utilization; fuel-handling methods; the transfer and generation of heat; general. The section on the transfer and generation of heat has chapters on heat transfer and insulation, boilers and steam generators, fundamentals of furnace design, methods of firing, and specific non-steam-making uses of fuel. A 16-page index helps locate desired information in the book.

Fuels and Combustion Handbook, by A. J. Johnson and G. H. Auth. Cloth bound, 6 x 9 inches, 915 pages. Published by McGraw-Hill Book Co., 330 West 42nd Street, New York 18, N. Y. Price, $12.50.

THE CLIMATE NEAR THE GROUND

Back in 1927, Dr. Rudolf Geiger, professor of meteorology, University of Munich, and director of the Meteorological Institute wrote a book on Climate of the Air Layer Near the Ground.

During the past decade, the science of microclimatology developed to an unexpected degree, and since the publication of the book in 1927, there has been research in allied science so that the original text required considerable revision to bring it up to date. It has also been out of print for several years. A new translation was started by Milroy N. Stewart and others, with considerable revisions and enlargements made by Dr. Geiger. This new work was published for the Blue Hill Meteorological Observatory, Harvard University, by the Harvard University Press.

Actually, the book consists of two parts—Part 1 covers the microclimate existing near the ground by virtue of its proximity to the ground surface; Part 2 is devoted to microclimate in its relation to topography, to plants, animals and man. Each part, in turn, is divided into several sections.

The 7 sections, in which the 41 chapters are grouped, cover heat exchange near the ground; temperature relationships near the ground; influence of the ground itself on the climate near it; the influence of topography; the influence of plant cover; the relation of animate creatures and man to the microclimate. Each of the chapters has an extensive bibliography should one desire to make a more detailed study of some of the points covered.

The Climate Near the Ground, by R. Geiger. Cloth bound 5½ x 8¼ inches, 482 pages. Published by Harvard University Press, Cambridge, Mass. Price, $5.

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PRESSURE CHARACTERISTICS OF A BLOWER USED WITH A FURNACE—Under a cooperative agreement between the University of Illinois Engineering Experiment Station and the National Warm Air Heating and Air Conditioning Association, a test program was established in 1946 to determine an arrangement and procedure for obtaining pressure characteristics of a blower when used in conjunction with a furnace. A practical and accurate means was arranged for determining the pressure characteristics of a blower in terms of the total pressure available externally to the blower furnace combination. This 70-page bulletin describes the test conducted, results obtained and the findings that were determined. University of Illinois, Urbana, Ill. Price, 50 cents.

ABBREVIATIONS FOR USE ON DRAWINGS—The 1946 edition of the American Standard Abbreviations for Use on Drawings has been revised under the joint sponsorship of the American Institute of Electrical Engineers and the American Society of Mechanical Engineers. In developing this edition, primary consideration was given to suggested changes and additions volunteered by users of the 1946 edition. The intent of the committee has been to provide a comprehensive but not all inclusive list of abbreviations for use on drawings. American Standards Association, Inc., 70 E. 45th St., New York 17, N. Y. Price, $1.

SAFETY IN WELDING AND CUTTING OPERATIONS—American Standard Z49.1-1950 has been issued to cover regulations for the safe installation and operation of welding equipment for all arc, gas and resistance weld-

ing processes. Provisions are included for fire prevention and protection in regularly assigned welding areas and also other locations. The protection of personnel is covered from the standpoint of the welder for whom eye protection and clothing requirements and health protection are prescribed, and from the standpoint of other workers in areas adjacent to welding operations. The ventilation requirements have been considerably modified. American Welding Society, 33 West 39th St., New York 18, N. Y. Price, 50 cents.

METALLIC ARC WELDING — The Pipefitter Welder's Review of Metallic Arc Welding, a paper-bound booklet prepared by Robert S. Green, consultant, National Certified Pipe Welding Bureau, explains how to make a good fusion weld by the metallic arc method. The procedure is explained step by step from the preparation of the stock to the placing of the last bead. The pamphlet is prepared in a style to simplify matters for the welder. National Certified Pipe Welding Bureau, 1250 Avenue of the Americas, New York 20, N. Y. Price, 50 cents.

APPARATUS NOISE MEASUREMENT — The American Standard Test Code Z24.7-1950 has been issued to cover the measurement of apparatus noise. It establishes uniform methods of conducting and recording sound level tests on apparatus and is intended as a guide for those who use sound level meters that meet requirements of the ASA. These test procedures of the ASA were developed by a committee sponsored by the Acoustical Society of America. Among the industries represented were air conditioning, refrigeration, heating and ventilating and fan manufacturers. American Standards Association, 70 E. 45th St., New York 17, N. Y. Price, 50 cents.

INSTRUMENTATION FOR THE PROCESS INDUSTRIES—Bulletin No. 120, published by the Texas Engineering Experiment Station, presents the papers and discussions of the papers given at the 4th Annual Short Course on Instrumentation for the Process Industries that was conducted by the School of Engineering of the Agricultural and Mechanical College of Texas in 1949. Ten papers were presented at this short course and they are printed in this 99-page bulletin. Texas Engineering Experiment Station, A & M College System, College Station, Texas.

NONCONDUCTING PIPE AND DUCT COVERING—Standard specifications are available for the usual materials required for nonconducting covering of plumbing, heating, ventilation, air conditioning and refrigeration piping, ducts, and equipment installed in buildings constructed by the Public Buildings Service, General Services Administration. Known as S50-4240, a copy can be obtained by writing to Public Buildings Service, General Services Administration, Washington 25, D. C.

WET VENTING OF PLUMBING FIXTURES—This is the second of a series of three National Bureau of Standards reports giving the results of an investigation of the problems involved in the proper venting of single plumbing fixtures or a relatively small group of such fixtures. The first report, BMS118, on stack venting of plumbing fixtures was published in January, 1950. This investigation on the wet venting of plumbing fixtures was sponsored by the Housing and Home Finance Agency as part of this agency's efforts to secure rational and economical design of housing. This 27-page report covers, among other things, tests on a single story, wet vented system, factors affecting the performance of wet vented systems and previous investigations of the performance of wet vented fixtures. Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price, 20 cents.

INSTALLATION OF GAS PIPING AND APPLIANCES—A new standard has been issued, American Standard Installation of Gas Piping and Gas Appliances in Buildings, Z21.30-1950, to apply to building low pressure gas piping systems that serve not in excess of ½ lb per sq inch and extend from the gas meter outlet to the inlet connections of appliances. It also covers the installation and operation of residential and commercial gas appliances supplied through public utilities system. It is not intended to cover systems distributing undiluted liquefied petroleum gas. The standard is published in a handy pocket size paper bound book of 99 pages. Price, 25 cents. American Gas Association Laboratories, 1032 East 62nd Street, Cleveland 3, Ohio.

UNORIFICED RADIATOR SUPPLY VALVES—On March 1, 1951, the Commodity Standards Division Recommendation for unorificed radiator supply valves became effective. It is identified as R243-51 and covers unorificed radiator supply valves for use in two-pipe low pressure steam heating systems. Mimeographed copies are available. Commodity Standards Division, Office of Industry and Commerce, Washington 25, D. C.

THEATER AIR CONDITIONING—The American Society of Refrigerating Engineers has issued application data 16-R on the air conditioning of theaters. It was prepared by G. B. Priester, air conditioning engineer, Consolidated Gas, Electric Light & Power Co., Baltimore, Md.; and O. W. Armspach, district chief engineer, Carrier Corp. It presents the fundamental requirements for this type of air conditioning. Price, 45 cents. American Society of Refrigerating Engineers, 40 West 40th Street, New York City.

TRAPS—The Commodity Standards Division of the U. S. Department of Commerce announced that on March 1, 1951 its proposed Simplified Practice Recommendation for low pressure thermostatic traps, radiator traps and float and thermostatic traps, becomes effective. It is identified as R244-51 and covers the traps made for use with steam heating systems. Definitions and general provisions are included and useful information given concerning these traps. Mimeographed copies of practices are available. Commodity Standards Division, Office of Industry and Commerce, Washington 25, D. C.

NEWS OF EQUIPMENT AND MATERIALS

Use the prepaid postcard opposite Page 98 for securing additional information on items described in this department.

Non-Slip Rubber-Fabric Belt

A rubber and fabric belt with teeth has been introduced by L. H. Gilmer Div., United States Rubber Co., Philadelphia, Pa. Known as the Gilmer timing belt, it fulfills the need for a power drive which will not slip and permits split-second precision timing. In addition, it will attain speeds up to 16,000 feet per minute, and is said to operate more quietly than precision gears running in an oil bath.

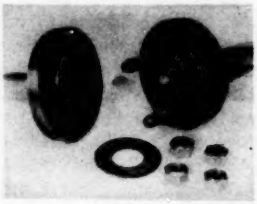
Perfected after 12 years of research, the belt is similar in appearance to a flat belt except that it has regularly spaced rubber teeth along its inner surface which engage in corresponding grooves in the pulleys. It can be manufactured in any desired size and in a variety of materials to suit specific applications. Currently, production is limited to specifically engineered applications. However, the company expects to offer a standardized line of stock drives in both heavy and light duty constructions with a sufficient number of pulleys to give an adequate range of speed ratios.

In addition to its anti-slip characteristic and precision timing, the new belt will not stretch. It will operate on fixed centers without take-up adjustments. Since it needs no initial tension it has unusually high efficiency with extremely low bearing pressure.

For more information, circle on Inquiry Card, **Item 1**

Flange Simplifies Piping

The Speedline insert flange, designed to simplify installation and reduce costs of tube and pipe installations, is announced by Horace T. Potts Co., Philadelphia, Pa. It consists of a corrosion - resistant, serrated insert in a carbon steel flange which is said to combine good strength at the connection and corrosion resistance throughout the internal area.



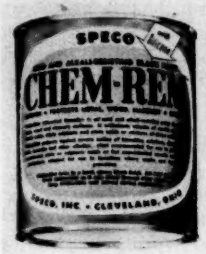
Installation of piping layouts is simplified in several ways. The assembly does not have to be heat-treated, as is frequently necessary after welding. Pipe cutting to exact length is simplified, as the thickness of a gasket is the only allowance which must be made. The flange is said to eliminate many of the difficulties previously encountered in threading, vanstoning or welding in connecting corrosion-resistant piping. An expanding tool and plain wrench are the only tools required for installing the Speedline insert flange.

Sizes available include those for standard tubing and nominal pipe sizes from ½ through 6 inches.

For more information, circle on Inquiry Card, **Item 2**

Paint for Stacks, Hoods, Pipe

An acid- and alkali-resisting black paint, Chem-Rem, has recently been improved by the addition of silicone, according to the manufacturer, Speco, Inc., Cleveland, Ohio. Silicone is reputed to enhance the paint luster and to provide smoother coverage with greater acid resistance. Increased water repellence is another feature.



The paint is suitable for both interior and exterior use on metal, masonry or wood. It withstands attacks of acetic and hydrochloric acids, dilute sulphuric acids, or mixtures of these acids. It is particularly recommended for locations where smoke and chemical fumes are prevalent.

Applications include tanks, stacks, vats, ventilating hoods, pumps, piping, towers, grilles, and standpipes.

For more information, circle on Inquiry Card, **Item 3**

Underground Pipe Insulator

The Durant insulated plate anchor, the purpose of which is to isolate underground piping from underground electrical currents at anchor points, is announced by Durant Insulated Pipe Co., Palo Alto, Calif.

A heavy steel plate anchors pipe and conduit against longitudinal movement due to pipe expansion or contraction. Anchor plate is normally imbedded in suitable external concrete anchoring block or structure.

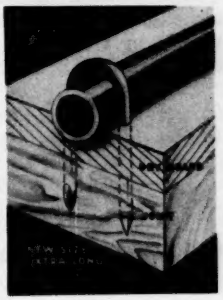
The plate, in the device, is not in direct contact with the interior piping, but is held in place between two attached plates. Separation is accomplished by the use of Transite asbestos cement sheets. In addition to the feature of electrical insulation, considerably reduced thermal losses are obtained.

The anchor is available in sizes from ½ to 24 inch I.P.S. and in all conduit diameters required.

For more information, circle on Inquiry Card, **Item 4**

Extra-Long Tubing Staples

Two new, extra long staples for fastening copper and brass tubing have been added to the Tube-Tite line manufactured by E. H. Titchener & Co., Binghamton, N. Y. They are designed for fastening copper tubing when dry board or plaster must be penetrated before the staple comes in contact with the joists.



The two new sizes, which accommodate $\frac{3}{8}$ inch nominal tubing and $\frac{1}{2}$ inch nominal tubing, are known as Item 304 extra long and Item 305 extra long, respectively. Both are round top, round wire staples made from pure copper with a steel core for strength.

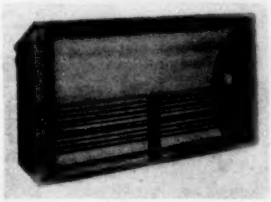
All Tube-Tite staples are made of copper to prevent galvanic action between tubing and staple, and they all contain a steel core for strength.

For more information, circle on Inquiry Card, **Item 5**

Unit Provides Germ-Free Air

An ultra-violet air disinfector, the Air-Tron louvered upper air unit, capable of providing a practically germ-free atmosphere for public gathering places has been developed by Roy C. Stove and Co., Chicago, Ill.

The disinfecting fixture has three characteristics: maximum ultra-violet output; maximum travel of germicidal energy through bacteria-filled air; and minimum ultra-violet below the fixture level and on nearby ceilings. It is equipped with two simple key-slots for easy mounting in any position, and is furnished with cord and plug. In addition, it can be recessed in the wall.



The unit is designed to direct ultra-violet rays across the upper area of a room without reflecting the rays from the ceiling down into the room. This curtails the possibility of injury to the skin and eyes of those present.

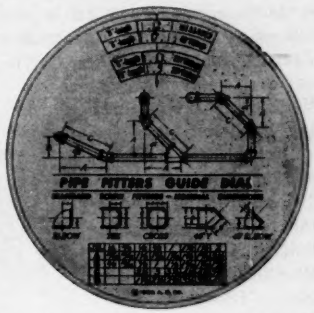
The unit already is intended for hospitals, sanitaria, schools, factories, libraries, laundries, theaters, restaurants, barber shops and beauty parlors.

The lamp has a life expectancy of 4,000 hours (approximately six months of continuous service). The eight-watt unit retails at $19.10 and provides air-purifying protection for an area up to 80 square feet. The 15-watt unit retails at $25.50, for areas up to 150 square feet. For air-purification for areas up to 425 square feet, the 30-watt unit, retailing at $14.50, is recommended.

For more information, circle on Inquiry Card, **Item 6**

Slide-Rule for Pipe Problems

A circular slide-rule, pocket-size, for computing length of pipe to connect at various angles has been introduced by Advance Dial Company, Chicago, Ill. The rule sells for $1.00 postpaid.



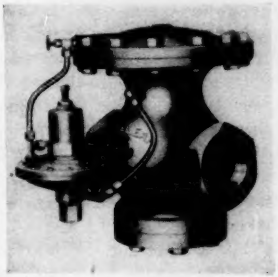
To use, the dial is rotated and the answer is found at a second. Ready reference tables appearing on the face and back of the rule provide additional and important information on pipe and pipe fittings.

The rule is intended for draftsmen, engineers, plumbers, steamfitters and others.

For more information, circle on Inquiry Card, **Item 7**

Pilot-Operated P. R. V.

The No. 228 pilot-operated pressure reducing valve has been introduced by McAlear Mfg. Co., Chicago, Ill. This valve is of the self-contained, external pilot-operated, diaphragm-actuated, pressure reducing type.



The valve can be used for service on steam, air, water, gas, or oil. It is especially recommended for applications of the following requirements: Accurate control of downstream pressure when there are wide variations in the supply pressure and load; large pressure differentials between inlet and outlet pressures; tight closure for dead-end service, and where there is need for a valve to close on diaphragm failure.

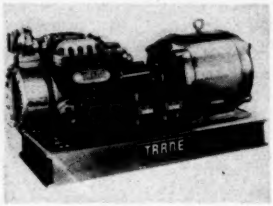
Metal diaphragms are used in both the main valve and pilot valve. Supply pressure forces the plugs in the main valve and pilot valve closed under dead-end conditions when there is no demand on the downstream side. The pilot seat and pilot plug are of hardened and ground stainless steel to resist the wire drawing action of high pressure differentials through the narrow opening between these parts, at which they operate during most of the time.

The valve is available with semisteel body, stainless steel trim, in sizes 1 to 6 inches, inclusive. It can be furnished with screwed connections in sizes 1 to 2 inches, inclusive, and with either 125 or 250 lb flanged connections in sizes $1\frac{1}{2}$ to 6 inches, inclusive. It is suitable for a maximum supply pressure of 250 lb per sq in. and a maximum temperature of 450F.

For more information, circle on Inquiry Card, **Item 8**

Reciprocating Compressor Line

New standards of quiet, vibration-free operation; low operating and maintenance costs, and long-wearing surfaces are incorporated in the design of the new line of reciprocating compressors introduced by The Trane Company, La Crosse, Wis., at the 10th International Heating & Ventilating Exposition in Philadelphia.



Designed for comfort and process air conditioning applications, the compressors are built in 10, 15, 20, 25, 40 and 50 ton capacities. Complete condensing units are also made in each size.

The compressors are free of vibration to such an extent that they require no special foundations, floor construction or soundproofing. Contributing to smooth operations are the cylindrical body design; V and W arrangements of the four, six and eight cylinder models; counterbalancing of all reciprocating forces; static and dynamic balancing of crankshafts, and reduction of moving weight through aluminum pistons and connecting-rods.

Low power consumption of the compressors results from the high volumetric efficiency of the basic design, and the completely automatic, internal multi-step capacity control or unloading system. As demand for cooling falls, the lowered suction pressure acts to reduce oil pressure in the capacity control system. This prevents the suction valves in each cylinder or pair of cylinders from functioning normally and serves to reduce the capacity of the compressor in three steps until minimum operating capacity is reached. Further reduction in suction pressure automatically shuts off the compressor.

The compressor is started completely unloaded. Cylinders cannot be loaded, or suction valves closed, until oil pressure builds up, loading the cylinders in turn. This feature permits quiet, direct drive by constant speed, 1,750 rpm, general purpose standard torque motors.

The reciprocating line is designed for operation with Freon-12 refrigerants.

For more information, circle on Inquiry Card, **Item 9**

Improved Magnesia Insulation

Announcement has been made by Ehret Magnesia Manufacturing Co., Valley Forge, Pa., of Thermalite, an improved 85% magnesia insulation in both pipe covering and block form. It is manufactured in sectional form in accordance with simplified thickness standards so that every size pipe covering will fit over or into another basic pipe size.

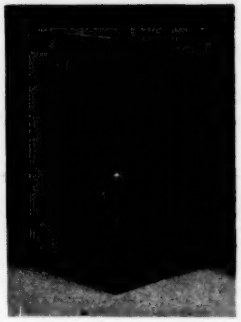
In addition, the number of basic sizes has been greatly reduced; and every practical size and thickness of pipe covering can be secured by the convenient application of successive layers of magnesia insulation. In cases of urgency, assembled sizes can be formed at the location of the job or from the local distributor's stock.

It is available in flat blocks 6 inches wide by 36 inches long and in 1, 1¼, 1½, 2, 2½ and 3 inch thicknesses; in a thickness of 1 inch for nine sizes of copper tubing ranging from ⅜ to 3 inches; in 1 inch thickness for 15 sizes of steel pipe from ¼ to 6 inches; 1½ inches thick in 24 sizes for pipe from ½ inch to 18 inches, and also for a wide range of sizes in thicknesses of 2, 2½, and 3 inches.

For more information, circle on Inquiry Card, **Item 10**

Oil and Gas Domestic Boilers

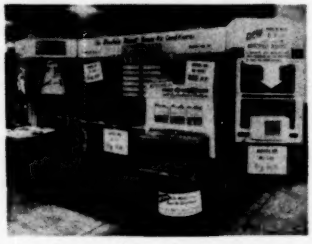
The Pacific round steel boilers were recently introduced by the Pacific Steel Boiler Division, U. S. Steel Radiator Corp., Detroit, Mich. They are designed for oil or gas firing, for steam or hot water. The boilers are covered with a thick blanket of reinforced insulation. The boilers are intended for domestic applications and can be supplied with a built-in instantaneous water heating coil of copper tubing. Precast refractory combustion chamber is included.



For more information, circle on Inquiry Card, **Item 11**

1951 Line of Air Conditioners

The 1951 expanded line of room air conditioners made by Mitchell Mfg. Co., Chicago, Ill., was displayed to distributors and dealers for the first time at the 10th International Heating and Ventilating Exposition in Philadelphia.



The line includes the ½ and ¾ hp air conditioners as well as two new models, a 1 hp heavy duty machine and a 1/3 hp unit, which lists at $229.95. All four units were demonstrated in action at the show.

Features include the dyna-cooling principle which is said to eliminate bends and other obstacles to the rapid flow of refrigerant through the cooling system, thus giving high cooling efficiency. Other features are the Turbo-Dryer, which dehumidifies the air, and the Air-Scoop fan. Another feature is the Mitchell mount, a special mounting cradle on the 1/3 hp air conditioner, which allows the window to be lowered between the decorative cabinet and the outside cabinet.

For more information, circle on Inquiry Card, **Item 12**

All-Fuel Line of Boilers

Introduced at the 10th International Heating and Ventilating Exposition in Philadelphia was the line of United States Radiator Corp., Detroit, Mich., U. S. Royal all-purpose boilers for steam or hot water heating and, with one exception, intended for all fuels. Also, with one exception, they are flush jacketed with jacket extension.

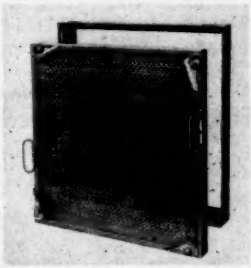
These boilers are available in four series, the US-12, US-21 and the US-28 designed to burn all fuels, and the US-16, a line of gas-burning boilers.

Advantages include easy erection and trouble-free operation, fully automatic design, and two-tone jacket of gray and maroon. Features of interest to wholesalers include minimum stocking requirements for steam or water and for boiler-burner units or boiler alone, for flush jacket or extended jacket. The flush jacket and jacket extension are packed in separate cartons.

For more information, circle on Inquiry Card, **Item 13**

High Velocity Air Filter

A new high velocity unit air filter, the Type HV, has been introduced by American Air Filter Co., Inc., Louisville, Ky. It is made of corrugated strips of fine mesh wire in which the corrugations taper so that when two strips are placed together they form a series of pyramid-shaped pockets. The small ends of the pockets are closed to the air flow to eliminate any open air passages through the media.



These filters are designed to operate at velocities up to 500 fpm and maintain a uniformly high cleaning efficiency over a wide range of air velocities. They can be serviced in the conventional way with washing and charging tanks, or reconditioned by washing out the accumulated dust with a hose and spraying with filter adhesive. Bulletin 203 is available.

For more information, circle on Inquiry Card, **Item 14**

Hydraulic Filter

A new Staynew hydraulic filter, recently announced by Dollinger Corp., Rochester, N. Y., is designed for use wherever dirty liquids are collected and recirculated. The new filter is suited for application on machine tools, hydraulic presses and many other types of hydraulically operated machines.

Savings are effected in three ways. First, unnecessary wear on costly pumps and other equipment is prevented by eliminating the intake of abrasive particles. Second, man hours are saved by eliminating idle time while worn machines are replaced or repaired. Third, spoilage and rejects at point of use are kept to a minmum by insuring clean, clear liquid.

Extreme simplicity is featured. There are only three major parts—lower end plate, insert and combined supporting tube, and upper end plate with threaded outlet sleeve. The entire unit may be disassembled in 30 seconds, and insert replaced at low cost or cleaned with solvent or brush.

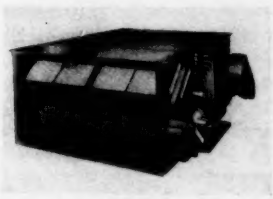
Insert is of radial fin construction. In most cases the filtering medium is 100 mesh stainless steel wire, which is particularly well suited to the filtration of cutting or quenching oils, but other metal media are available.

For more information, circle on Inquiry Card, **Item 15**

Line of Air Conditioning Units

A new line of air conditioning units designed for a wide range of requirements has been introduced by Massachusetts Blower Division, The Bishop & Babcock Mfg. Co., Cleveland, Ohio. The line consists of seven sizes with capacities ranging from 1,000 cfm to 14,000 cfm, built with various heating and cooling coil combinations to suit requirements.

Built in sections, these units reduce the work in handling and erection, are of sturdy construction, and can be had in either vertical (top view) or horizontal (lower view) mounting and with various combinations and arrangements of discharge with by-pass and face dampers in coil section if desired. Sections reinforced with angle members and removable panels are provided to facilitate access to the interior.



Units are thoroughly insulated inside to insure minimum noise and maximum temperature control. Filter section is constructed to take from one to four inches of removable filters which can be readily placed in position from either end of unit.

Fan assembly consists of duplicate double inlet, double width multiblade wheels and housings. Bearings are bronze bushing type, self-aligning, with double oil reservoirs and are mounted externally.

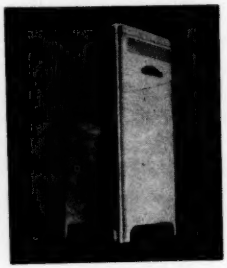
Heating is attained with steam or hot water coils and comfort cooling is supplied by direct expansion refrigerant coils.

A 44-page catalog is available containing complete description, performance and specification data.

For more information, circle on Inquiry Card, **Item 16**

Low Cost Dehumidifying Unit

A low cost electric dehumidifier, Model D-181, designed for home and commercial use, is announced by The Mitchell Mfg. Co., Chicago, Ill. Called the Sahara, the dehumidifier removes from two to three gallons of water from up to 10,000 cubic feet of closed area in a 24-hour period. The retail price is $129.95.



The unit is constructed of 19-gage furniture steel finished with baked enamel. It is powered by a ⅛ hp compressor, operating on 115 volts, 60 cycles AC, and is simply plugged into an electrical outlet. Dehumidifying action takes place when warm air is drawn into the system, passes over cold metal coils containing Freon-12, where the water vapor in the air condenses, collects and drains into a container or a permanent drain. Dried air is then returned to circulate through the room. The machine is compact, measuring one foot square by 30 inches high, and weighing 55 pounds.

For more information, circle on Inquiry Card, **Item 17**

Cold Galvanizing Stops Rust

A completely new method of cold galvanizing called Zinkrich, for surface protection of steel and iron, has been announced by Chase Chemical Corp., New York, N. Y.

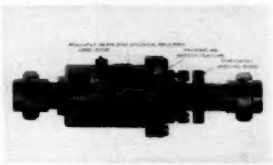
The new process has widely diversified applications in industry, and may be effectively used on any structure. When applied to steel or iron surfaces, the material creates an electrochemical union, thus allowing zinc to become galvanized to the base metal's surface. It leaves a coating of 96 parts by weight of chemically pure zinc. In cases where it is applied directly onto adhering rust, it induces the rusted area to create its own protective, non-flaking coating, arresting further rust.

It is applied with an ordinary paint brush, electric spray gun or cold dip. No special equipment or personnel training is necessary.

For more information, circle on Inquiry Card, **Item 18**

Water Line Expansion Joint

A factory-assembled packless expansion joint, Type 111-M, for hot water heating system lines, service water lines, or any service where it is desirable to allow for expansion of liquid carrying lines, is available from Fulton Sylphon Div., Robertshaw-Fulton Controls Co., Knoxville, Tenn. The joints are easily and quickly installed as any pipe fitting.



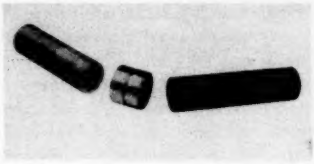
The cut-open section in the top of the photo shows the construction. A multi-ply Sylphon bellows made of Monel metal provides the packless feature. All other parts, except bolts, are made of brass. Available in standard pipe sizes ½ to 3 inches, inclusive, the joints are suitable for pressures up to 100 lb per sq in.

The flax packing provides a safety feature and only functions when a leak occurs. This leakage is absorbed by the packing which swells and makes a tight seal.

For more information, circle on Inquiry Card, **Item 19**

Thin—Standard Pipe Connector

The Speedline aligning connector (center of photo), for use with Schedule 40S pipe (left) or light-walled 5S pipe (right), has been introduced by Horace T. Potts Co., Philadelphia, Pa. Both pipes have the same O.D. size, while the Schedule 5S pipe has a larger internal cross-section. Thus, this connector permits the use of light-walled, lower cost, Schedule 5S corrosion-resistant piping in conjunction with present installations of Schedule 40S pipe. In a number of installations, the connector has been used with Schedule 5S pipe as a means of increasing internal flow areas in piping systems.



The connector for connecting light-wall to heavy-wall or light-wall to light-wall piping is made in pipe sizes and tubing O.D. sizes from ½ through 4 inches. Methods of joining include soft soldering, silver brazing and socket welding.

For more information, circle on Inquiry Card, **Item 20**

Electric Baseboard Heater

A 450-watt baseboard Glassheat panel unit for entire or auxiliary heating of homes, schools, office buildings, boats, motels, churches and hospitals, is announced by Continental Radiant Glass Heating Corp., New York, N. Y.

This unit is rectangular and measures approximately 9 by 30 inches, including the frame. It has been designed for use under picture windows or in any location where baseboard heating is contemplated. The panels are controlled by individual room thermostats.

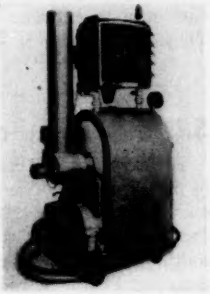
The heating capacity of each unit is 400 cubic feet in a well-insulated building with a rating of 1535 Btu per hour.

The glass heating element is said to be twenty times stronger than ordinary glass. The unit consists of a resistance grid of sprayed aluminum fused into the tempered glass, set in an aluminum reflector pan and surrounded by a steel frame.

For more information, circle on Inquiry Card, **Item 21**

Portable Steam Space Heater

A fully automatic, oil fired, portable steam space heater is announced by Quiet Automatic Oil Burner Corp., Newark, N. J. It is suitable for heating large confined spaces and is adaptable for spaces where, under other conditions, there might be danger of carbon monoxide. Construction contractors, warehouse operators and manufacturers will find this a useful unit for keeping men working in spaces that ordinarily are too large to heat.



The unit burns 1½ gallons per hour of No. 2 fuel oil and its large self-contained fuel tank holds thirty gallons. A forced draft device works regardless of draft conditions. Fully equipped with thermostat on extension cord, and mounted on rubber-tired casters, it is easily moved. All that is required is an electrical outlet.

For more information, circle on Inquiry Card, **Item 22**

1951 Air Conditioning Units

Incorporating many important new design changes, inside and out, the new line of 1951 Bakeraire air conditioning units was introduced recently by Baker Refrigeration Corp., South Windham, Maine.

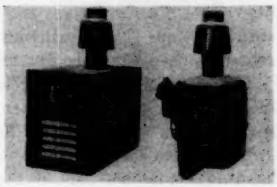
Featuring greater cooling efficiency in a more compact design, the new line is built in capacities of 3, 5, 7½ and 10 tons. Over-all height has been substantially reduced. Each unit is constructed with a one-piece rigid steel frame and a removable plenum designed for front or rear discharge. Extreme operating quiet is assured by means of vibration-eliminating spring compressor mountings.

Cooling efficiency has been increased through a new cooling coil in the compressor compartment to dissipate heat. New water and drain connections make this the easiest and fastest of all unit air conditioners to install.

For more information, circle on Inquiry Card, **Item 23**

Unit Apartment Gas Boiler

A midget gas-fired hot water heating boiler, Model 2HW2, has been introduced by Hook & Ackerman, Inc., New York, N. Y., and designed especially for heating individual apartments.



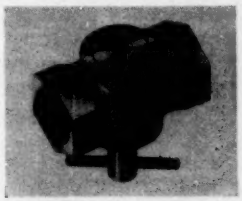
Boiler is of all cast iron construction and measures 13 inches wide, 26 inches deep and 17 inches high.

Due to its small size it can be suspended from the ceiling or arranged on a wall shelf. The unit comes completely assembled and does not require any electrical connection. It has an AGA input rating of 45,000 Btu and will supply 188 square feet standing radiation. This capacity is sufficient for heating of 4- to 5-room apartments.

For more information, circle on Inquiry Card, **Item 24**

Precise Flow Regulating Valve

A new and different flow regulating valve is announced by Reynolds-Shaffer Co., Detroit, Mich. It is a de luxe stopcock for use where an exact setting of the regulated flow of water or other liquids is required. It can be used as a flow-regulating valve for jet pumps and spray pumps; as a by-pass valve on boiler feed lines; in fact, any place where a quick-opening, easy-operating flow-regulating valve, or stopcock is needed.



The valve is guaranteed, due to 0 Ring packing, not to leak externally. Exceptionally close fitting permits only the slightest internal weeping. In spite of this extremely close fit the plug turns easily for accurate manual adjustment without use of tools.

The valve is available in ¾ inch pipe size in two models, the RV-1 with full port with area of 1 inch pipe in port; and the RV-2 with a ¼ inch port for fine adjustments. The latter is for use in place of needle valves and similar fine adjustments.

For more information, circle on Inquiry Card, **Item 25**

Conserves Roof Cooling Water

The Apsco hydro-electric operator has been introduced by the April Showers Co., Inc., Washington, D. C., for use with its automatic roof cooling system. The purpose of the operator is to keep the roof sprays operating when necessary but to prevent their operation to such an extent that there is an overflow of water from the roof. Consequently, it conserves water.

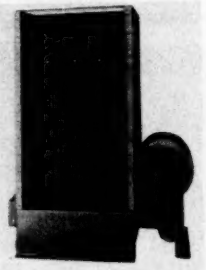
The device consists of a small tank with a float, two needle valves, one acting as an inlet, the other as an outlet to the tank, and a mercury switch mechanism.

The needle valves are adjusted to maximum humidity conditions and by this adjustment allow the proper amount of water to flow through the tank to the spray. When the thermostat is calling for water due to a high roof temperature, the water flows to the roof sprays but the operator, through the float and mercury switch arrangement, prevents the accumulation of water on the roof even though the thermostat is calling for water when there is sufficient water lying on the roof.

For more information, circle on Inquiry Card, **Item 26**

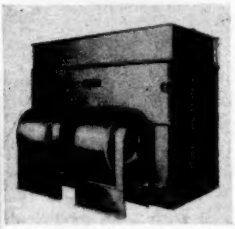
Forced Draft Cooling Towers

A new and improved Dry-Fan blower type cooling tower is introduced by Binks Mfg. Co., Chicago, Ill., in two models.



The Series 2-B is a single fan model (see top view showing section) available in 9 sizes, with capacities from 3 to 30 tons of refrigeration. The smallest tower in the 2-B Series is 2 x 2 x 6 ft.; the largest 6 x 6 x 7½ ft.

Air enters through a squirrel cage type fan at the bottom of the tower and is exhausted through redwood drift eliminators at the top. For indoor installations special adaptor hoods are available for the top of tower. These make it simple to connect the necessary exhaust ducts. The smaller models, capacities up to 7 tons, are shipped completely assembled. Larger towers are knocked down.



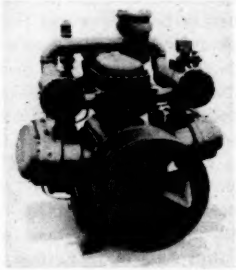
The Series 2-BB are equipped with two double-inlet squirrel cage blowers (see bottom photo). These towers are made in 4 sizes, with capacities ranging from 32 to 60 tons of refrigeration.

They operate on the same principle as the 2-B towers and offer the same features.

For more information, circle on Inquiry Card, **Item 27**

9-Cylinder Compressors

Introduced at the 10th International Heating and Ventilating Exposition in Philadelphia for the first time was the 9-cylinder Eclipse refrigerating machine built by Frick Co., Waynesboro, Pa. These units have a nominal capacity at full rated speed on air conditioning work of 90 tons of refrigeration. They are intended for commercial applications as well as for process plants, ships, and similar jobs.



The compressors are of 4⅜ inch bore and 4¼ inch stroke arranged in three banks of three cylinders each so as to give a uniform torque on the shaft. Standard speeds are 725, 850, and 900 rpm.

For more information, circle on Inquiry Card, **Item 28**

Pipe Line Identification Labels

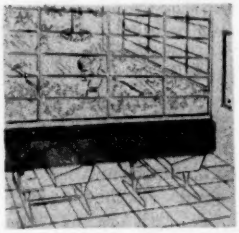
A method of marking fuel, oil and hydraulic lines at low cost and maximum efficiency is announced by E-Z Code Div., Western Lithograph Co., Los Angeles, Calif.

The labels are pressure-sensitive and are applied with finger-tip pressure. They will not pop, peel, or curl even in extreme changes of heat and humidity. They are available in standard symbols and codes.

For more information, circle on Inquiry Card, **Item 29**

Sill Type Radiator

The Sil-Type radiator has been placed on the market by The Rittling Corp., Buffalo, N. Y. It is designed for schools, apartments, offices and other buildings with continuous sash construction, and where the radiator offers advantages in addition to forming the actual window sill itself.



Constructed of rust-resistant metal with a prime coat, the units are available in any sill depth or height. They permit temporary heat, provide a sill, and become the finished wall under the windows and thus eliminate considerable plastering and wall finishing.

Finned tube surfaces used are of seamless steel tubing with heavy steel fins. Fins are attached by a tube expansion process.

For more information, circle on Inquiry Card, **Item 30**

Gaskets for Tubecap Covers

Maintaining perfect seals for boiler handhole and tubecap cover assemblies at a minimum maintenance cost is now possible with the application of Style T gaskets made by Flexitallic Gasket Co., Philadelphia, Pa.

These gaskets require no compounds and can frequently be reused if not removed from cover assemblies during outage. This economy is due to the feature of spiral-wound construction, the spiral winding of V-crimped plies alternated with plies of filler. The V-crimp gives the metal strip a strong, resilient action. This resiliency permits the gaskets to rebound when they are not under compression.

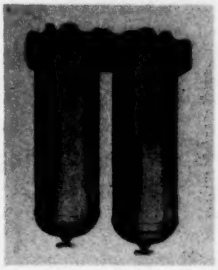
The gaskets are available in two thicknesses: 0.125 inch for use with assemblies having narrow seating surfaces and high bonding loads; 0.175 inch for use in assemblies having broad seating surfaces and low bonding loads.

Standard Style T Gaskets are available in three pressure ranges of operating pressure for practically all makes of boilers.

For more information, circle on Inquiry Card, **Item 31**

Water Line Filters

On display at the 10th International Heating and Ventilating Exposition in Philadelphia were two new Fulflo filters for use on the water lines of air conditioning systems to eliminate clogging of spray nozzles by removing microscopic impurities from the water supply, shown by Commercial Filters Corp., Boston, Mass.



These filters are available in two models, one with two tubes (illustrated), the other with three. The tubes are nickel-plated and have 10-inch honeycomb filter tubes. Straight-line pipe connections are at the ends of the headers for minimum pipe fittings.

A wide range of filter tubes are available for different filtration problems and depending on the operating temperature, pressure, viscosity, volume, nature of liquid, and nature of contaminant. Other features include the fact that they are drilled and tapped for studs for attachment to wall; single center bolts so that only one nut per shell need be loosened for speedy servicing, and only one inch of clearance is needed below the drain cocks to replace honeycomb filter tubes.

For more information, circle on Inquiry Card, **Item 32**

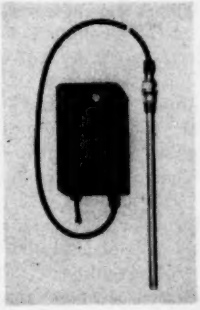
1000F Heat Resistant Finish

A new heat resistant finish, Sicon, formulated from a silicone base, Sicon, is available from Midland Industrial Finishes Co., Waukegan, Ill. It is for application to industrial furnaces, heating units, incinerators, and similar products; and it is recommended by the manufacturer for protecting and preserving the surfaces of many other products where ordinary heat resistant finishes fail. It is stable up to 1000 deg. F.

For more information, circle on Inquiry Card, **Item 33**

Refrigerant Level Control

The Select-A-Level liquid level control is announced by Sporlan Valve Co., St. Louis, Mo. It is an electronic device used to maintain the liquid level of flooded type refrigeration systems using Freon-12, Freon-22 or ammonia. It is designed to actuate a solenoid valve, magnetic contactor, or other equipment requiring the opening and closing of an electrical circuit to maintain constant liquid levels.



The control consists of three major parts: control unit, sensing element, and coaxial cable which connects the sensing element to the control unit. The component parts of the main control unit, including the vacuum tube, relay unit and electronic unit, are replaceable.

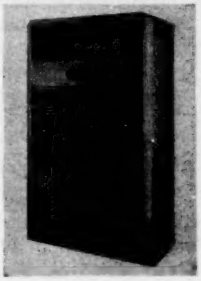
The Select-A-Level control has no moving parts in direct contact with the refrigerant. It does not operate through the use of contact-making electrodes, float balls, buckets, or tilting mercury tubes.

The sensing element, a porcelain coated steel rod mounted in a steel tube, can be installed directly in a refrigerant evaporator-accumulator or pressure vessel, or it may be used in any liquid column where present practice utilizes a mechanical float unit. Liquid levels can be maintained anywhere between 0 and 30 inches, depending upon length of sensing element used.

For more information, circle on Inquiry Card, **Item 34**

8 Ton Unit Conditioner

The newest and largest self-contained air conditioning unit to be added to the Westinghouse line is the 8 ton Model SU-81 Unitaire, exhibited at the 10th International Heating & Ventilating Exposition in Philadelphia by the Sturtevant Div., Westinghouse Electric Corp., Hyde Park, Boston, Mass.



This conditioner, available for many types of applications for comfort or process air conditioning requirements, has a capacity of 96,000 Btu per hour and is powered by a newly designed compressor, type CLS-282.

The unit provides cooling, dehumidifying, air circulation, and air filtering for hot weather comfort and for certain industrial type or process applications. All-year-round air conditioning can be obtained by the addition of either steam or hot water heating coils and an outside air duct connection for ventilation supply. Single unit installations can provide air conditioning for all types of commercial establishments, offices, factories, and homes. Larger spaces with heavier cooling requirements can be effectively conditioned by multiple installations.

Usually the Unitaire is installed directly in the conditioned space, but it may be installed outside the conditioned space with connecting ducts to distribute the conditioned air to discharge outlets arranged to meet load conditions. Standard accessories are available for duct connections.

For more information, circle on Inquiry Card, **Item 35**

Panel Heat Control Slide-Rule

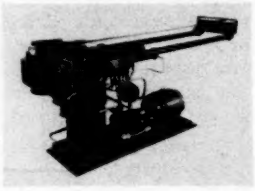
A new slide-rule to help heating contractors and service men determine the proper thermostatic control for radiant panel heating has been introduced by Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

The pocket calculator, second in a series of handy guides, makes it an easy job to calibrate the outdoor and indoor thermostats used with the company's electronic control system for radiant heating.

For more information, circle on Inquiry Card, **Item 36**

1¼ In. Hydraulic Pipe Bender

The Model 800 pipe bending machine is announced by Wallace Supplies Mfg. Co., Chicago, Ill. It is a small compact machine only 21 inches wide, 34 inches high and 78 inches long for space saving, but with power well beyond its capacity of 1¼ inch O.D. or No. 16 B.W.G. steel tubing. The unit is powered by a standard 2 hp motor furnished with the machine.



The machine is operated by a single lever which when pushed down causes the bending arm to swing around to the degree of bend selected and stay there until the operator has removed the bent part, then the lever is moved up and the arm swings back to its original position.

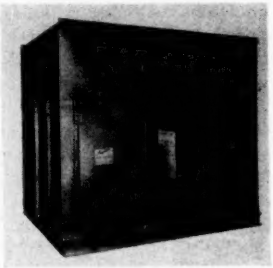
The bender can be changed simply and easily from a right-hand bender to a left-hand bender by changing the pressure and clamping arms over and inserting the bolts into holes ready for that purpose.

The 10-inch steel pipe to which the top and base is welded is also the tank containing the hydraulic fluid.

For more information, circle on Inquiry Card, **Item 37**

Encased Precipitron Units

The latest member of the Precipitron family made its debut at the 10th International Heating & Ventilating Exposition in Philadelphia at the exhibit of the Sturtevant Div., Westinghouse Electric Corp., Hyde Park, Boston, Mass. This newest unit is supplied as a prefabricated product with all parts completed and matched at the factory for field assembly into a completely encased unit.



The basic idea behind the encased precipitator is to offer a packaged type of assembly combining a standard Precipitron air cleaning element and a standardized prefabricated housing. There are numerous advantages to such a combination. The engineer can now select and specify standard units as a part of the air conditioning or ventilating system layouts with the assurance that the air cleaner portion of these layouts is properly coordinated. The units may be indicated on drawings to almost exact dimensions, and without elaborate details or specifications on the layout and construction of the sheet metal work.

The use of encased units is also advantageous to the contractor. The enclosures are quite similar to housings for air washers, with which he is already quite familiar. With metal shortages existing and growing worse, the contractor is relieved of the responsibility of drawing up plans for a housing, fabricating it in his shop and erecting it to satisfy the requirements of the consulting engineer or purchaser. Prices on the encased units are such that the contractor can buy these for about equal or perhaps less than the cost of a standard unit plus his cost for designing and fabricating the enclosure.

The unit as shown is a Type PE 76 with a capacity of 14,000 cfm at 90% efficiency, or 16,800 cfm at 85% efficiency. The net weight of this unit is approximately 2,500 lb. The unit shown is only one of 24 sizes.

For more information, circle on Inquiry Card, **Item 38**

Flow Regulating Valves

A complete line of flow regulating valves is announced by The Swartwout Co., Cleveland, Ohio. Known as Type V10 valves, the units are designed to handle steam and water at high pressure drops, and, especially, flashing condensate. Uses include drainage for storage heaters, evaporator coils, flash tanks, process systems, subcooled heaters, boiler blowdown, feed pump recirculation, and other severe service conditions where high-velocity impingement causes frequent maintenance or complete valve replacement.

All internal parts of the valve, seat, disc and long guide sleeve, are made of stainless steel which has been heat-treated and ground to precision fit. Valve design, with exclusive scroll inlet and gradually expanded straight outlet, eliminates direct impingement and resulting corrosion-erosion effects.

The valves are supplied in seven pipe sizes ranging from one to four inches.

For more information, circle on Inquiry Card, **Item 39**

New Unit Air Conditioner

Recently introduced by Carrier Corp., Syracuse, N. Y., is the series 50K6 Weathermaker, a unit air conditioner. Device includes all the elements for cleaning, cooling, dehumidifying, ventilating and circulating air, and a heating coil can be furnished if desired.

The casing is 41 inches wide, 22⅞ inches deep, and 64 inches high; with a plenum this unit is 90⅞ inches high. The Freon compressor is of the four-cylinder, V-type direct driven by a 5 hp motor, and condenser is of the shell and coil type using finned copper tubing. There are two 20 x 25 inch standard size filters of the throw-away type and a multi-reflex muffler eliminates gas discharge pulsations.

One double inlet centrifugal fan is used and the louvers on the plenum grille are adjustable, permitting the flow of air to be directed to any desired direction. Unit is equipped for a Humitrol for diverting refrigeration capacity from temperature reduction to moisture removal so as to prevent a cold clammy condition in the discharge air.

For more information, circle on Inquiry Card, **Item 40**

PRODUCT INFORMATION SERVICE

Use the postage-free postcard below for further information on:

- **News of Equipment and Materials**
- **New Catalogs**

Circle the Item Number in which you are interested and print clearly your name and address with title.

NEW CATALOGS

LOCK ROLLING MACHINES 6

Bulletin 950, describing its models 22 and 24 lock rolling machines, has been issued by Roy G. Flagler Manufacturing Co., Detroit, Mich. Machines are equipped with both Pittsburgh and double seam rolls. .....Item 41

FLANGE SELECTOR SLIDE-RULE 83

A revised edition of the Flange and Coupling slide-rule type selector, designed by Nooter Corp., St. Louis, Mo., is available to all engineering personnel upon request. The selector lists data on the outside diameter of flange, thickness, outside diameter of raised face, number of holes, diameter of holes, diameter of bolts, and bolt circle for 150 and 300 lb flanges. It also shows average sizes of standard, extra heavy, 3000 pound and 6000 pound couplings, and a convenient pipe standard table is incorporated, showing nominal wall thicknesses for schedules 10 to 160 pipe as well as nominal thicknesses and weight per foot for standard, extra heavy and double heavy pipe. .....Item 42

EVAPORATIVE CONDENSERS 25

Catalog No. 600, 4 pages, has been published by McQuay, Inc., Minneapolis, Minn., and devoted to its line of evaporative condensers for Freon-12, Freon-22 and methyl chloride. Complete capacity and descriptive material is accompanied by information on the selection of evaporative condensers as well as specification data. .....Item 43

UNIT AIR CONDITIONERS 29

A 6-page bulletin, Form 601, has been issued by Brunner Manufacturing Co., Utica, N. Y., and devoted to its floor type unit air conditioners available in four sizes of 3, 5, 7½ and 10 hp. Bulletin is most comprehensive and includes cut-away views, parts clearly shown, complete information on the various components, including the condensing unit, cooling coil and controls, and accompanied by complete dimensional and capacity information. One page is devoted to general information on determining capacity, notes on installation and operation, which is exceptionally well prepared. ....Item 44

DATA CARD FOR PIPING ENGINEER 94

Dimensions on welding fittings and flanges that could otherwise be found only by searching through many catalog pages and tables have been condensed and reproduced by Taylor Forge & Pipe Works, Chicago, Ill., on two sides of an 8½ x 11 inch card. One side covers the broad Weldell line of welding fittings. It shows wall thickness and essential dimensions for all types of fittings for every nominal pipe size from ½ through 30 inches. The other side gives essential dimensions, and bolting data are given for all types of flanges, in all weights, for nominal pipes sizes from ½ through 24 inches. The cards are varnished on both sides to enable them to withstand prolonged use. .....Item 45

SLIDE-RULE SHOWS FUEL SAVINGS 114

A pocket-sized guide to help apartment, hotel and office building owners save money on annual fuel costs has been introduced by Minneapolis-Honeywell Regulator Co., Minneapolis, Minn. The guide is designed in slide-rule style, and shows, for example, how wind effect may double the building's heat loss. It also illustrates the proper length of burner operation in proportion to outside temperature. Purpose of the guide is to demonstrate how the company's Weatherstat control system automatically reduces needless waste of heat and fuel. Item 46

SOLVING VENTILATING PROBLEMS 56

Catalog 3146, 1001 Ventilating Problems Solved, is now available from Herman Nelson Div., American Air Filter Co., Inc., Moline, Ill. It is intended for institutional, industrial, and commercial users of ventilating fans. This 12-page booklet describes the six basic models of propeller fans manufactured by Herman Nelson and illustrates many of their prime applications. One feature pointed out in the booklet is the "air foil" profile of the fan blade with the pitch increasing toward the hub. This not only increases efficiency and permits quieter operation but minimizes undesirable overloading tendencies. .....Item 47

HIGH TEMPERATURE INSULATION 15

A 4-page folder on Marinite has been issued by Johns-Manville, New York, N. Y., and covering its high temperature insulation of that name for use on breechings, ovens and driers. .....Item 48

DRAFT GAGES AND THEIR USE 36

Bulletin 109 has been released by Ellison Draft Gage Co., Chicago, Ill. This bulletin describes portable, stationary and laboratory type inclined draft gages and accessories. Instructions for securing readings in conjunction with Ellison pilot tubes are given, as well as suggestions for use of the draft gage in connection with domestic heating plants. Tables and useful data are included. .....Item 49

EXPANSION JOINTS 34

A new edition of its catalog on expansion joints has been issued as Bulletin EJ-1912 by Yarnall-Waring Co., Philadelphia, Pa. Consisting of 16 pages, the bulletin gives complete descriptions of its line of Gun-Pakt piping expansion joints in both the all-steel and all-brass types. Included is a two-page description on how to figure expansion of pipe lines and anchors for pipe lines. .....Item 50

SNAP-ACTING SWITCHES 16

Bulletin M-2-D, which illustrates and describes a complete line of small snap-acting contact units, has been released by Penn Electric Switch Co., Goshen, Ind. It lists various types of compact, sturdily constructed contact units suitable for application wherever a mechanically operated electric switch is required. Bulletin gives complete ordering specifications for both open and closed types, single and double pole types, and light and heavy duty types. .....Item 51

Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 36, SEC. 34.9, P. L. & R., NEW YORK, N. Y.

HEATING AND VENTILATING

148 LAFAYETTE STREET

NEW YORK 13, N. Y.

READERS' SERVICE DEPT.

SAFETY VALVE SELECTION CHART 65

A steam capacity chart in two colors, for determining the steam capacity required from safety valves to give complete protection in case of pressure reducing valve failure, has been issued by Marine and Industrial Products Co., Philadelphia, Pa. .....**Item 52**

HOT WATER CIRCULATORS 14

A bulletin entitled Hot Water Circulation has been issued by Water Service Laboratories Inc., New York, N. Y. It describes in some detail the various hot water piping arrangements used in buildings, how the water circulates and explains how to overcome some operating difficulties that interfere with such circulation. .....**Item 53**

REGULATORS AND DAMPERS 43

A 6-page standard size 1951 catalog has been issued by The Young Regulator Company, Cleveland, Ohio, covering its line of relief and multi-blade dampers for efficient temperature regulation. The catalog includes specifications and illustrations of relief and fresh air dampers, convector regulations, air-split damper regulators, remote control damper regulators, corner pulley, bearing sets, end bearings, multi-blade dampers, remote control registers and similar data equipment and accessories. .....**Item 54**

CONDENSED OIL BURNER CATALOG 51

A condensed 16-page catalog has been issued by Ray Oil Burner Co., San Francisco 12, Calif. Catalog gives a complete listing, with illustrations, of the company's oil burner products, including fully automatic horizontal rotary type, steam turbine driven type; comibnation gas-oil type; semi-automatic type; and pressure atomizing type. Booklet features a unique selector chart, plus listing of specifications and capacities. .....**Item 55**

CENTRIFUGAL REFRIGERATION UNIT 40

A standard size bulletin, DS-399, 38 pages, has been issued by The Trane Co., La Crosse, Wis., and devoted to its new CenTraVac hermetic centrifugal refrigeration unit. The book is exceedingly comprehensive in giving not only full information on the design and construction of the unit, but also on lubrication system, method of purging, and selection of proper unit, together with selection examples, tables of capacities, arrangement of flow, engineering specifications, and methods of control. ....**Item 56**

HUMIDIFIER DATA 48

An 8-page catalog, Form Gen. 1, has been issued by Maid-O'-Mist, Inc., Chicago, Ill., devoted to its line of automatic humidifiers for steam, hot water, and warm air heating systems, including convector humidifiers, steam vent humidifiers, air eliminators, float control valves, automatic water feeders, and other specialties. .....**Item 57**

SCALE CONTROL 19

Bulletin No. 100, 4 pages, has been issued by Aqua Electric Scale Control, Cleveland, Ohio, describing the company's method of controlling formation of scale in all types of equipment using water or cooled by water. Method involves use of a packaged unit available in three models. .....**Item 58**

PRIMER ON REFRIGERATION 82

A to Zero of Refrigeration, a new educational booklet by Educational Service, General Motors Corp., Detroit, Mich., tells in interesting and non-technical language how the modern electrical refrigerator works. The 93-page booklet, with 118 illustrations in color, is available in limited quantities to schools, colleges, libraries and other educational institutions. The booklet also outlines how food freezers, gas refrigerators and air conditioning equipment work. It goes on to describe research into odd phenomena in the region of absolute zero. .....**Item 59**

INFRARED HEAT FOR FARMS 29

A 16-page booklet, A-5815, explaining how infrared heat lamps can help increase farm productivity and profits, is available from Westinghouse Lamp Division, Westinghouse Electric Corp., Bloomfield, N. J. Included are illustrated instructions for building pig, lamb, and chick brooders, and poultry water fountains and feeders. Use of infrared radiant heat in dehydrating meats, vegetables, fruits, and berries is explained, and a simple dehydrator is illustrated. Milkhouse heating, engine warming, pipe thawing, and paint drying are among the other uses of infrared heat. **Item 60**

STEAM TRAP PROBLEMS 71

Traps has recently a revision of its 36-page catalog, Solving Steam Trap Problems, which contains helpful, practical information for engineers, contractors and maintenance men who specify, install or service steam traps, is announced by The V. D. Anderson Co., Cleveland, Ohio. It contains revised, up-to-the-minute specifications and capacities on the complete line of Super-Silvertop steam traps, float traps, air release valves and pipe line strainers. Describes how to calculate condensation loads and select traps for all classes of equipment, including unit heaters, jacketed kettles, autoclaves, submerged surfaces, hospital, kitchen and laundry equipment, steam mains, header drips and other units, and gives pointers on how to install traps with the fewest number of fittings in the shortest possible time. .....**Item 61**

DUCT SIZING SLIDE-RULE 74

Calculating duct sizes for either forced or gravity warm air heating systems is simplified with a new slide-rule calculator offered by Armco Steel Corp., Middletown, Ohio. Determining the leader pipe and register size for a gravity system requires only one setting of the slide and a quick reference to a table. For forced warm air systems, three settings of the slide determine round or rectangular duct sizes from a given register air temperature and the heat required. Another part of the calculator determines duct weight per foot of length in one operation. Rule is handy pocket size and made of heavy, enameled paperboard for durability. Offered at printing cost, 50 cents each. .....**Item 62**

1951 FAN CATALOG 34

A four-page bulletin describing its illustrating in color, and describing in detail its complete line of fans for 1951, is offered by The Emerson Electric Mfg. Co., St. Louis 21, Mo. This colorful 32-page catalog gives design and construction specifications with complete performance data on desk and stand fans, air circulators, ceiling fans, kitchen ventilators, exhaust, attic and window fans. Included is detailed dimensional information for its attic fans, window fans, exhaust fans and ventilating fans. **Item 63**

HUMIDITY CONTROL BULLETIN 43

A new periodical, **The Humidity Engineer**, designed to present current technical and operating information on Kathabar humidity control equipment, has been instituted by Surface Combustion Corp., Toledo, Ohio. The magazine is intended to provide up-to-date information on engineering developments in humidity control as applied to all phases of the air conditioning field. Comfort conditioning and industrial processing applications are two additional important features to be covered in this bulletin. Air conditioning engineers, process engineers, and plant maintenance men are offered the magazine on a gratis basis by writing on their letterhead to the company. .....**Item 64**

NEW TYPE COOLING TOWER 26

A four page bulletin describing its cooling towers is available from Aqua-Therm, Inc., Dayton, Ohio. Feature of the tower is the packing bed of Berl saddles, heretofore used primarily in scrubbing towers. These corrosion-resistant ceramic saddles provide greatly increased surface area in relation to total volume. Bulletin describes how the use of saddles permits operating economy and use of low tower heights. Technical data and a specimen cooling tower problem are presented. .....**Item 65**

PIPE LINE FILTERS 19

An 8-page standard size bulletin, entitled Staynew Pipe Line Filters for Air and Other Gases, has been brought out by Dollinger Corp., Rochester, N. Y. The double-action principle of filtering employed in these products is described, as well as the various models of pipe line filters. .....**Item 66**

PLEASE SEND US MORE INFORMATION. Circle below item numbers on which you wish further information.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66				

PLEASE PRINT Mar. H/51

Name.....

Title.....

Firm.....

Street.....

City..... Zone..... State.....

This card is void after June 1, 1951

DEGREE-DAYS FOR JANUARY, 1951

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city.

HEATING AND VENTILATING's 23rd Year of Publication of Monthly Degree-Day Data

City	January			Cumulative, September 1 to January 31			Heating Season[1]
	1951	1950	Normal	1950-51	1949-50	Normal	Normal
Abilene, Texas (A)	632	541	326	1628	1411	1251	2061
Albany, New York (A)	(a)	1046	1287	(a)	3532	3726	6580
Albuquerque, New Mexico (A)	874	845	924	2113	2525	2751	4298
Alpena, Michigan (C)	1383	1256	1431	4247	3985	4382	8299*
Anaconda, Montana (C)	1444	1610	1321	4537	4753	4492	8357**
Asheville, North Carolina (C)	807	407	831	2592	1938	2520	4232
Atlanta, Georgia (C)	602	296	682	1921	1375	1813	2890
Atlantic City, New Jersey (C)	822	634	992	2409	2066	2727	5176
Augusta, Georgia (A)	561	216	555	1753	996	1441	2161
Baker, Oregon (C)	1224	1453	1218	3598	4085	4033	7163
Baltimore, Maryland (C)	806	562	955	2405	1923	2619	4533
Billings, Montana (A)	1376	1857	1318	4090	4617	4134	7119
Binghamton, New York (C)	1219	886	1268	2529	3200	3783	6808
Birmingham, Alabama (A)	557	218	589	1908	1260	1502	2352
Bismarck, North Dakota (A)	1925	2334	1807	5573	5739	5321	9192
Block Island, Rhode Island (A)	901	755	1048	2627	2383	2784	5788
Boise, Idaho (A)	1107	1222	1097	3056	3552	3382	5552
Boston, Massachusetts (A)	953	886	1150	2800	2737	3280	6045
Bozeman, Montana (C)	1593	1614	1403	4752	4663	4689	8521**
Buffalo, New York (A)	1124	926	1240	3548	3199	3612	6822
Burlington, Iowa (A)	1315	1187	(a)	3916	3353	(a)	(a)
Burlington, Vermont (A)	1316	1191	1429	4033	3855	4202	7514
Butte, Montana (C)	1567	1651	1309	4807	4927	4492	8235**
Cairo, Illinois (C)	837	628	908	2535	1945	2407	3909
Canton, New York (C)	(a)	1218	1520	(a)	4033	4515	8020
Charleston, South Carolina (C)	431	150	487	1351	735	1119	1769
Charlotte, North Carolina (C)	662	356	725	2019	1486	1945	3120
Chattanooga, Tennessee (A)	695	334	732	2206	1633	1957	3118
Cheyenne, Wyoming (A)	1308	1265	1215	3837	3904	4104	7466
Chicago, Illinois (C)	1196	1020	1190	3537	3002	3362	6077
Cincinnati, Ohio (C)	902	658	1017	2848	2169	2813	4684
Cleveland, Ohio (A)	1080	868	1181	3462	2943	3366	6155
Columbia, Missouri (A)	1053	931	1110	3079	2621	3006	4922
Columbia, South Carolina (C)	544	250	586	1688	1126	1502	2364
Columbus, Ohio (C)	1003	761	1113	3228	2581	3133	5398
Concord, New Hampshire (A)	1229	1156	1349	3791	3862	4081	7353
Concordia, Kansas (C)	1163	1227	1184	3152	3074	3203	5315
Dallas, Texas (A)	572	516	617	1495	1290	1487	2256
Davenport, Iowa (C)	1346	1200	1352	3865	3311	3685	6289
Dayton, Ohio (A)	1093	820	1116	3538	2855	3063	5264
Deer Lodge, Montana (C)	1472	1624	1376	4782	4865	4894	8672**
Denver, Colorado (C)	1175	1039	1079	3158	2914	3355	5874
Des Moines, Iowa (A)	1380	1379	1392	3965	3552	3762	6384
Detroit, Michigan (A)	1148	997	1252	3605	3224	3584	6490
Devils Lake, North Dakota (C)	2029	2436	1949	6062	6224	5820	9970
Dodge City, Kansas (A)	1117	1089	1116	2957	2835	3068	5035
Dubuque, Iowa (C)	1483	1341	1442	4177	3714	3976	6790
Duluth, Minnesota (C)	1804	1902	1727	5542	5313	5216	9483
Eastport, Maine (C)	1176	1182	1380	3672	3719	4270	8520**
Elkins, West Virginia (A)	975	694	1048	3453	2836	3265	5697
El Paso, Texas (A)	634	484	629	1413	1553	1667	2428
Ely, Nevada (A)	1221	1382	(a)	3665	4240	(a)	(a)
Erie, Pennsylvania (C)	1046	830	1172	3278	2801	3336	6273
Escanaba, Michigan (C)	1506	1525	1550	4668	4445	4688	8771
Evansville, Indiana (A)	969	698	949	2979	2316	2494	4244
Fort Smith, Arkansas (A)	778	637	850	2198	1877	2027	3147
Fort Wayne, Indiana (A)	1161	975	1194	3778	3181	3405	5925
Fort Worth, Texas (A)	583	540	580	1500	1346	1406	2148
Fresno, California (A)	598	686	583	1288	1710	1494	2334
Galveston, Texas (C)	295	127	353	684	398	683	1016
Grand Junction, Colorado (A)	1220	1291	1233	3026	3076	3511	5548
Grand Rapids, Michigan (A)	1252	1077	1262	3877	3297	3659	6535
Green Bay, Wisconsin (C)	1651	1530	1538	4922	4453	4420	7825
Greensboro, North Carolina (A)	777	469	772	2464	1901	2167	3529
Greenville, South Carolina (A)	687	397	744	2086	1620	2078	3380
Harrisburg, Pennsylvania (A)	973	771	1088	3081	2651	3069	5375
Hartford, Connecticut (A)	1046	939	1159	3175	3076	3316	6036
Hatteras, North Carolina (C)	504	214	589	1444	902	1316	2571
Havre, Montana (C)	1672	2379	1624	4907	3239	4938	8700
Helena, Montana (A)	1487	1998	1375	4739	5239	4433	7894**
Houston, Texas (C)	327	158	366	777	516	815	1157
Huron, South Dakota (A)	1671	1930	1650	4838	4791	4735	8004
Indianapolis, Indiana (A)	1105	852	1128	3518	2813	3130	5298
Jackson, Mississippi (A)	486	215	(a)	1532	969	(a)	(a)
Kansas City, Missouri (A)	1057	1075	1141	3053	2674	3007	4956
Knoxville, Tennessee (A)	708	407	815	2367	1762	2298	3670
La Crosse, Wisconsin (A)	1670	1610	1535	4779	4428	4313	7322
Lander, Wyoming (A)	1375	1460	1436	4190	4499	4511	7947

(a) Data not available.

[1]Figures in this column are normal totals for a complete heating season, September to June, inclusive.

Figures in this table, with seven exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y., and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively; Anaconda, Bozeman, Butte, Deer Lodge and Livingston, Mont., through the courtesy of the Montana Power Company.

[Table concluded on page 1001

Degree-Days for January, 1951 (Concluded)

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city.

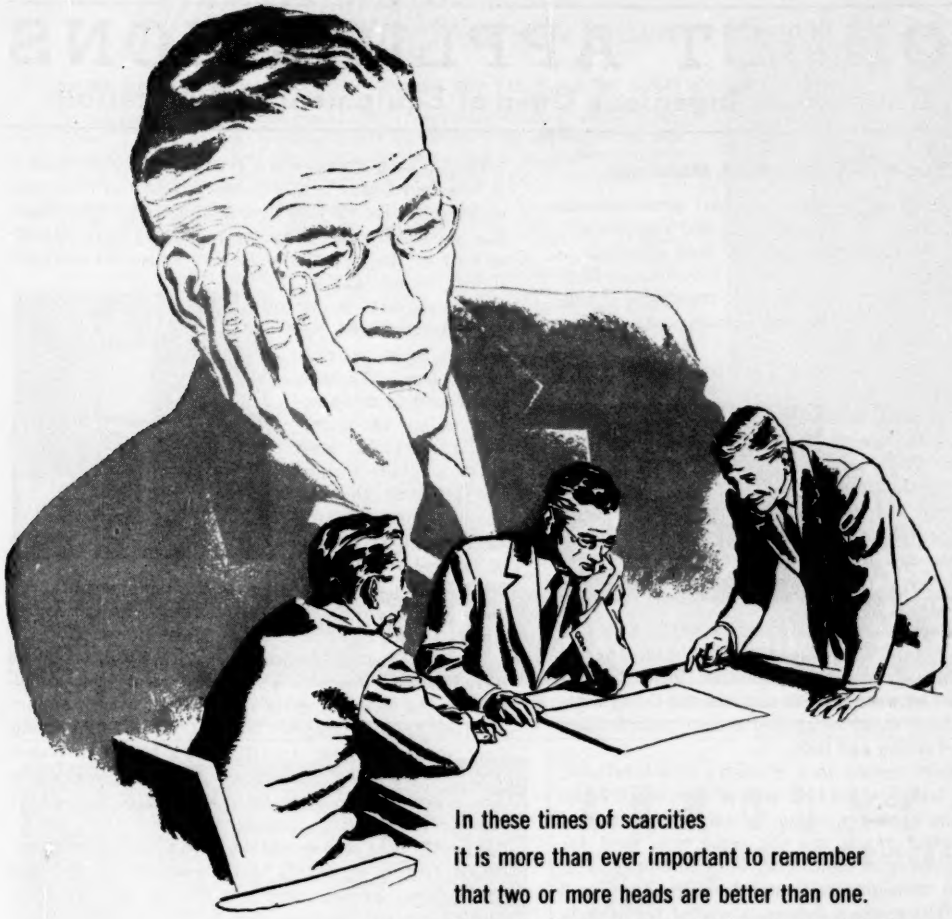
HEATING AND VENTILATING'S 23rd Year of Publication of Monthly Degree-Day Data

City	January			Cumulative, September 1 to January 31			Heating Season[1]
	1951	1950	Normal	1950-51	1949-50	Normal	Normal
Lansing, Michigan (A)	1250	1080	1336	3973	3585	4001	7048
Lewiston, Maine (O)	1262	1241	1452	3804	3826	4289	7707
Lincoln, Nebraska (C)	1300	1388	1311	3563	3400	3512	5999
Little Rock, Arkansas (A)	671	494	719	2035	1568	1798	2811
Livingston, Montana (C)	1323	1576	1220	4067	4224	3951	7245**
Los Angeles, California (C)	298	443	326	518	857	750	1504
Louisville, Kentucky (A)	(a)	630	939	(a)	2162	2526	4180
Lynchburg, Virginia (A)	835	529	856	2613	2032	2413	3980
Macon, Georgia (A)	469	164	549	1564	993	1446	2201
Madison, Wisconsin (C)	1528	1373	1500	4394	3919	4258	7429
Marquette, Michigan (C)	1455	1517	1500	4576	4467	4554	8693*
Memphis, Tennessee (A)	682	465	744	2140	1611	1871	2950
Meridian, Mississippi (A)	500	177	552	1643	1052	1435	2160
Milwaukee, Wisconsin (A)	1375	1237	1383	4205	3724	3984	7245
Minneapolis, Minnesota (A)	1721	1800	1609	4919	4607	4550	7850
Montgomery, Alabama (A)	424	121	515	1556	843	1284	1884
Nantucket, Massachusetts (A)	898	798	1026	2749	2609	2938	5957
Nashville, Tennessee (A)	763	509	812	2472	1851	2175	3507
New Haven, Connecticut (A)	1011	891	1110	3009	2845	3219	5895
New Orleans, Louisiana (C)	236	48	332	813	416	735	1024
New York, N. Y. (C)	877	697	1028	2581	2192	2884	5274***
Nome, Alaska† (A)	4946	1849	1857	7768	4618	5236	14580**
Norfolk, Virginia (C)	596	351	738	1834	1314	1933	3350
North Head, Washington (C)	731	968	725	2431	2658	2510	5452**
North Platte, Nebraska (A)	1251	1429	1300	3651	3760	3786	6366
Oakland, California (A)	510	642	527	1137	1716	1626	3143**
Oklahoma City, Oklahoma (C)	776	831	865	2123	2050	2244	3613
Omaha, Nebraska (A)	1380	1440	1355	3787	3536	3639	6131
Oswego, New York (C)	1146	1005	1277	3572	3288	3771	7088
Parkersburg, W. Virginia (C)	889	652	992	2937	2352	2822	4775
Peoria, Illinois (A)	1254	1105	1283	3796	3205	3606	6109
Philadelphia, Pennsylvania (C)	848	642	962	2524	2100	2661	4737***
Phoenix, Arizona (C)	370	418	409	610	883	990	1405
Pittsburgh, Pennsylvania (C)	989	692	1054	3157	2466	3003	5235
Pocatello, Idaho (A)	1271	1314	1218	3664	3998	3867	6655
Portland, Maine (A)	1220	1176	1321	3811	3777	3926	7218
Portland, Oregon (C)	757	1097	806	2225	2064	2530	4469
Providence, Rhode Island (C)	929	847	1116	2791	2689	3246	6015
Pueblo, Colorado (A)	1139	985	1060	3099	2968	3224	5514
Raleigh, North Carolina (C)	642	359	722	2013	1426	1975	3234
Rapid City, South Dakota (A)	1367	1736	1320	4044	4374	4021	7118
Reading, Pennsylvania (C)	911	732	1088	2825	2449	3102	5389
Red Bluff, California (A)	647	821	(a)	1506	1783	(a)	(a)
Reno, Nevada (A)	980	1102	1042	2925	3431	3326	5892
Richmond, Virginia (C)	722	452	831	2263	1686	2211	3695
Rochester, New York (A)	1158	978	1252	3621	3350	3666	6732
Roseburg, Oregon (C)	(a)	901	744	(a)	2516	2485	4428
Roswell, New Mexico (A)	820	607	786	2000	2057	2296	3484
Sacramento, California (C)	579	660	614	1306	1661	1610	2653
St. Joseph, Missouri (A)	1158	1204	1187	3295	3084	3147	5161
St. Louis, Missouri (C)	981	829	1060	2964	2295	2798	4585
Salt Lake City, Utah (A)	1092	1184	1110	3061	3463	3259	5555
San Antonio, Texas (A)	443	246	381	1044	687	854	1202
San Diego, California (A)	287	395	332	571	849	819	1645
Sandusky, Ohio (C)	1068	858	1181	3350	2771	3323	6208
San Francisco, California (C)	450	553	465	1155	1486	1414	3264**
Sault Ste. Marie, Michigan (A)	1563	1530	1581	4901	4771	4828	9285**
Savannah, Georgia (A)	441	108	409	1380	695	1007	1490
Scranton, Pennsylvania (C)	1037	841	1172	3296	2982	3446	6129
Seattle, Washington (C)	758	1117	781	2328	2789	2650	4934**
Sheridan, Wyoming (A)	1409	1775	1431	4193	4628	4629	8008
Shreveport, Louisiana (A)	513	311	555	1471	1070	1324	1938
Sioux City, Iowa (A)	1480	1628	1435	4201	4066	4018	6898
Spokane, Washington (A)	1168	1735	1172	3696	4402	3755	6355
Springfield, Illinois (C)	1100	965	1181	3375	2713	3183	5373
Springfield, Missouri (A)	964	855	973	2891	2529	2647	4428
Syracuse, New York (A)	1182	980	1277	3697	3304	3768	6893
Tacoma, Washington (C)	810	1128	812	2523	2949	2763	5181**
Terre Haute, Indiana (A)	1080	845	1070	3477	2742	2910	4872
Toledo, Ohio (A)	1147	959	1203	3698	3167	3392	6077
Topeka, Kansas (C)	1072	1133	1135	2970	2827	3018	4969
Trenton, New Jersey (C)	902	697	1014	2759	2394	2774	4933
Utica, New York (O)	1205	1094	1248	3845	3443	3785	6796
Valentine, Nebraska (C)	1398	1622	1370	4049	4193	4095	7039
Walla Walla, Washington (C)	905	1468	989	2701	3309	2898	4808
Washington, D. C. (C)	774	513	970	2405	1904	2711	4626
Wichita, Kansas (A)	1010	1065	1094	2746	2629	2877	4673
Williston, North Dakota (C)	1835	2398	1805	5485	5935	5463	9323
Winnemucca, Nevada (C)	1050	1189	1150	3163	3726	3739	6427**
Yakima, Washington (A)	1127	1625	1159	3483	3913	3587	5599

(a) Data not available.
†Nome data are for December

*Includes August.
**Includes July and August.
***New 48-year normal covering 1898 to 1946.

[1]Figures in this column are normal totals for a complete heating season, September to June, inclusive.



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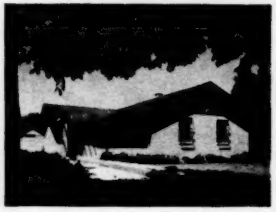
Low Cost Homes Use Industrial Materials

PROBLEM: In order to meet customer preference as indicated by a survey of architects and engineers, a Westchester, Illinois, home builder was required to build 72 homes with: (1) six rooms, including a utility room, all on one floor; (2) tile walls from floor to ceiling in kitchen, bath, and utility room; (3) radiant heating; (4) minimum cost.

SOLUTION: The problem of incorporating the first three choices with the fourth was solved by using new materials serving more than one purpose, eliminating wasteful items, and by on-the-job prefabrication of certain articles.



Structural glazed tile blocks, ordinarily used in industrial construction, available in a wide selection of colors, were used to produce tile walls in the kitchen, bath and utility rooms. A structural partition was thus provided between these rooms and the living room on which plaster could be applied directly, eliminating necessity of furring and lath.

For a radiant heated floor, Fenestra structural steel panels were laid over a 4-inch slab of reinforced Zonolite insulating concrete, using vermiculite instead of sand. The steel panels are the same type used for spanning members on multi-story office buildings. Hot air is forced through steel panel raceways from wall to wall, and the entire sub-floor is welded together to form a solid sheet of radiant steel surface over which is poured two inches of concrete topped by an oak parquet floor secured in mastic.

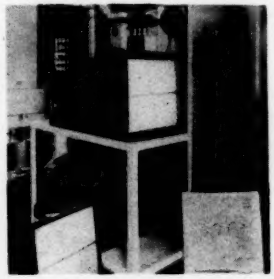
Another industrial material used to cut costs was an aluminum awning type window, which includes weather stripping and interior screen at a cost below that of the conventional double hung wood window unscreened and without weather stripping.

Roof trusses were used so that all roof weight is carried on masonry side walls.

RESULTS: Use of industrial materials and careful planning has created an attractive home at minimum cost. Homes were designed by Robert Schultz and M. S. Carstens, architects; general contractor was the Clark Construction Co.

Carbon Filters Air for Micro Wave Radio

PROBLEM: In the nationwide network of micro wave radio repeater stations developed by Bell Telephone Laboratories for the American Telephone and Telegraph Co., certain vacuum tubes require a steady stream of cooling air for best operating efficiency. Although each station has a single air pressure source, it was found that temperatures within identical tube enclosures were varying over a wide range. Investigation showed that temperature variations were directly related to the quantity of air entering the cavities. It was found that deposits of dirt in air passageways and on vacuum tubes restricted air flow. The dust was found to be an accumulation of microscopic particles and silver sulphide formed by action of the sulphide in air combining with the silver plating of the inner cavity.



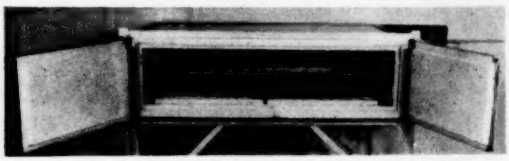
SOLUTION: In conjunction with impingement type glass filters provided with the original equipment, an efficient barrier type of filter material known as Filter Down, a product of the American Air Filter Corp., was introduced. While this eliminated most microscopic particles, a second step in the solution was to supply air free from sulphides. W. B. Connor Engineering Corp. devised a filter consisting of a bed of activated carbon 1½ inches thick, held between two screens in a frame which could be directly substituted for one of the two impingement type filters.

RESULTS: The blower system, with a maximum capacity of 40 cfm against a static pressure of 5 inches water gage, operates with less then ½ inch pressure drop across the combined filters. The combination of standard dust filters, Filter Down barrier, and activated carbon adsorber is successful.

Glassheat Panels Form Preheating Oven

PROBLEM: Television masks require preheating before cutting.

SOLUTION: At Haberland Mfg. Co., Allwood, N. J., the use of infra-red bulbs for preheating was replaced by Glassheat panels in sets of 4 arranged to form ovens.



RESULTS: Length of time required to preheat masks has been cut from 5 to 2 minutes. Electric consumption has been reduced and replacement of heating element has been eliminated.

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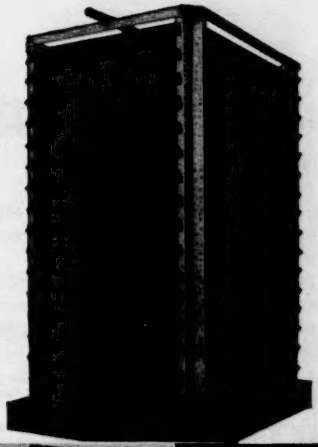

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A Graphical Method of Sizing Cyclone Dust Collectors

EDITOR, HEATING AND VENTILATING:

Sir, I have read with great interest the article on "Sizing of Cyclone Dust Collectors" by Leonard Monroe in your issue of December 1950.

Experimental investigations into the collecting efficiency and the pressure loss of Cyclones have been made on a rather large scale in the mechanical laboratory of the Technical University at Delft (Holland).

The results of these experiments do not quite correspond with the data published in Mr. Monroe's article, and in some points considerable differences can be stated.

I agree with Mr. Monroe that the pressure loss $\triangle p$ of a cyclone will be proportional to the inlet velocity head (I.V.H.) of the gases, and that this proportion $\triangle p/\text{I.V.H.} = F$ does not change very much, when the dimensions of the cyclone are decreased or increased in a proportional manner.

The value of the constant F depends on the shape of the cyclone dust collector, especially on the ratio: inlet area/exhaust-area $\left(\frac{b\,h}{e^2}\right)$ and further on the ratios: e/D, L/D, A/D, H/D, etc. (See Fig. 1 in Mr. Monroe's article reproduced here.)

After our experiments the pressure loss $\triangle p$ of a cyclone may be expressed by a general formula:

$$\triangle p = c.\left(\frac{b\,h}{e^2}\right)^n (\text{I.V.H.}) \qquad \text{(Equation 1)}$$

In this formula c and n are dimensionless constants, depending only on the shape of the cyclone dust collector.

Although we know approximately the influence of the above mentioned ratios on the value of c and n, it is advisable to determine these constants experimentally and not to rely on theoretical calculations only.

For different types of cyclone collectors these experiments were carried out in our laboratory at Delft.

For a plain cyclone, without guiding vanes in the inlet or in the exit ducts as shown in Fig. 1 in Mr. Monroe's article, the exponent n was found to be approximately $n = 1$; the constant $c = 25$ to 32, so the formula for the pressure loss will be:

$$\triangle p = (25 \text{ to } 32)\left(\frac{b\,h}{e^2}\right)(\text{I.V.H.}) \qquad \text{(Equation 2)}$$

This formula is similar to the expression proposed by Shephard and Lapple, but holds good only when plain cyclones with a straight tangential inlet duct are considered.

For cyclones with a volute or a half-volute inlet duct lower values for n and c have been found; the pressure loss will be lower under similar conditions in comparison with the above mentioned cyclones.

By using guiding vanes one can reduce the pressure loss considerably; the effect on the collecting efficiency, however, is unfavorable, especially when an inlet vane is extended to the exit duct.

In Table 2 of Mr. Monroe's article, measured pressure losses of various cyclones are published. Comparing the figures of this table with the results of our experimental investigations we can conclude, that the figures of the First and Shephard cyclones correspond passably with our experiences; but it seems to me that the figures given in Table 2 for the pressure losses of the A.F.A. and Alden cyclones are too low.

In order to check our formulas 1 and 2 and to obtain reliable figures for the pressure losses, a model of the A.F.A. cyclone was constructed (see Fig. 2) and both the pressure loss and the collecting efficiency were measured accurately in our laboratory.

The dimensions of the cyclone and the measuring arrangement are shown in Fig. 1. The quantity of the gases passing the cyclone was determined by the orifice M; from this quantity the average velocity head

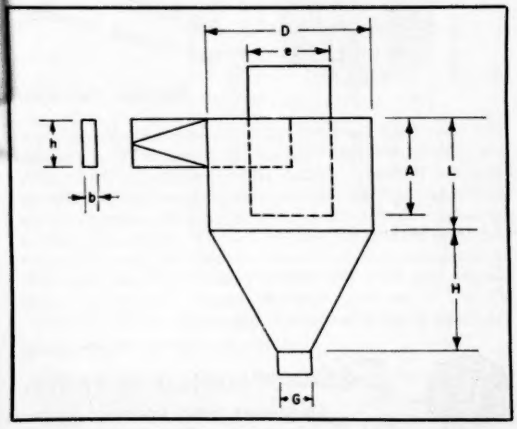

Fig. 1. Basic cyclone from H&V, p. 63, Dec. 1950.

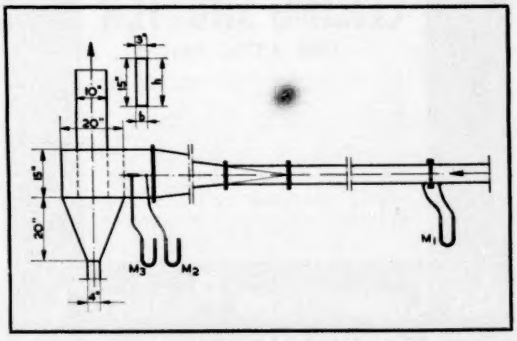

Fig. 2. Model of A.F.A. cyclone.

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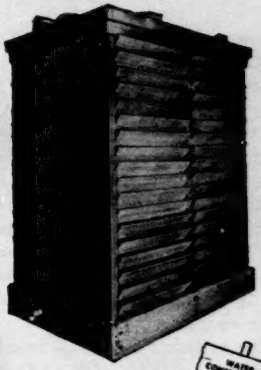

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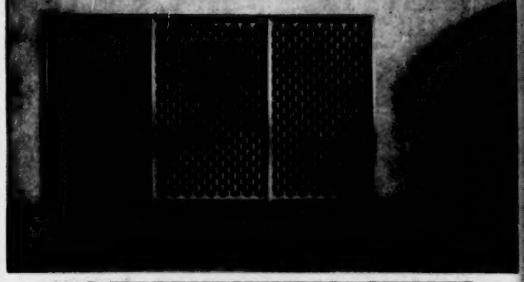

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of the gases in the entry of the cyclone (I.V.H.) was deduced.

The rotation of the gases in a cyclone causes a core of low pressure in the center; this core extends the full height of the cyclone and over a considerable length of the exhaust duct. It is, therefore, difficult to measure the average value of the static or total pressure of the gases in the exhaust. In order to avoid this difficulty a cyclone with a free exhaust to the atmosphere was used (see Fig. 2). The manometer M2 gives the static pressure loss of the cyclone, the manometer M3 the drop in total pressure between the entry of the cyclone and the atmosphere.

The pressure loss was measured for different gas velocities, varying from 15 ft per sec to 50 ft per sec in the entry of the cyclone. As was expected, the static pressure loss $\triangle p$ for this velocity-range can be expressed by the formula:

$$\triangle p = 27\left(\frac{b\,h}{e^2}\right)(\text{I.V.H.}) = 12.3\ (\text{I.V.H.}) \qquad (F = \text{constant})$$

This pressure loss is about 8 times the pressure drop published in Mr. Monroe's article.

The influence of the inlet velocity V_1 (or of the gas-quantity) on the collecting efficiency of the A.F.A. cyclone is shown in Fig. 3. For these measurements fine

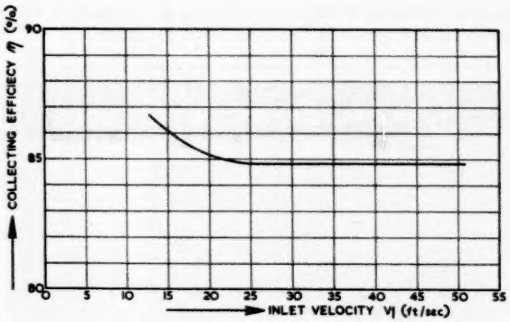

Fig. 3. Influence of inlet velocity on efficiency.

clay dust with a constant size analysis was used. It proved that a variation of V_1 from 15 ft per sec to 50 ft per sec, corresponding with a variation of the separation factor $S = V_1^2/g\ r$ from 8.4 to 93 had only a small influence on the efficiency. It was even proved that at a low velocity V_1 the efficiency was slightly higher than at a high velocity. Although for other types of cyclones an increase of efficiency could be obtained by increasing the gas-velocity V_1, the efficiency curve was generally a smooth one, and the influence of V_1 on efficiency slight. So it is obvious that the factor S is not decisive for the efficiency of a cyclone.

The flow of gases and dust particles inside a cyclone is a very complicated phenomenon.

In reality, apart from the centrifugal separation factor S, several other factors (e.g. the radial gas-velocity inside the cyclone) exert an influence on the separation of the dust particles.

It is not advisable to base the sizing of a cyclone on the separation factor S only.

Pr. ir. A. J. ter Linden

Delft, Holland.

EDITOR, HEATING AND VENTILATING:

The example in the dust collector design article, pages 63-66, December 1950 issue, gives a collector size not in keeping with commercial practice.

A collector 10 ft in diameter for handling 2,000 cfm could never be sold in a competitive market. Furthermore, the ratio of cylinder area to inlet area is usually 15 to 20 and not as low as 3, as used in the example. There must be some error in the nomograph, Fig. 4, page 65. Using the chart for a ratio of 15 for cylinder to inlet area gives a cylinder diameter of approximately 18 ft for 2,000 cfm and a separation coef. of 40.

F. R. Ellis

Hyde Park, Mass.

MR. MONROE SAYS:

I must confess there is an error. It will be necessary to divide the system air quantity by 60 before entering the chart. The nomograph may then be used as indicated in the article to obtain correct diameters. For example, if we use Mr. Ellis' hypothetical data of 2,000 cfm, area ratio of 15, and separation coefficient of 40, we must first divide 2,000 by 60 and then enter the chart with this new air quantity. Doing so yields a diameter of about 3.7 ft, which is more in keeping with standard practice.

Leonard Monroe

Brooklyn, N. Y.

NEWS BRIEFS

• At the Annual Meeting of the Industrial Unit Heater Association, held in Philadelphia, Pennsylvania, January 22-23, 1951, the following officers were re-elected for the ensuing year: J. C. Patterson, president; H. S. Wheller, vice president; and L. O. Monroe, secretary-treasurer. Mr. Patterson is director of sales, industrial heating, Carrier Corp., Syracuse, N. Y. Mr. Wheller is president of the L. J. Wing Manufacturing Co., Linden, N. J.

• Diamond Iron Works, Inc., Minneapolis, Minn., has announced the purchase of the entire Stokol line of mechanical coal-fired stokers from Chrysler Corp., Airtemp Division, Detroit, Michigan. All future manufacturing, sales and distribution rights accrue to Diamond Iron Works, Inc. as a result of the outright purchase.

• The Building Research Advisory Board of the National Research Council, at its meeting on February 15, 1951, adopted a resolution to the effect that the preparation of a climatological atlas of the United States based upon existing data is of immediate urgency to this country.

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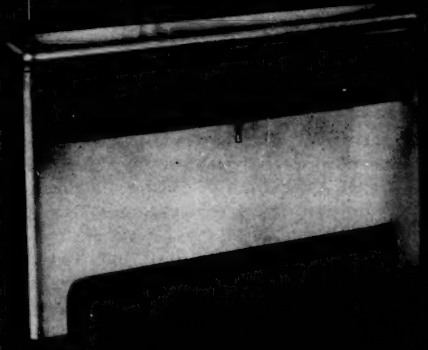

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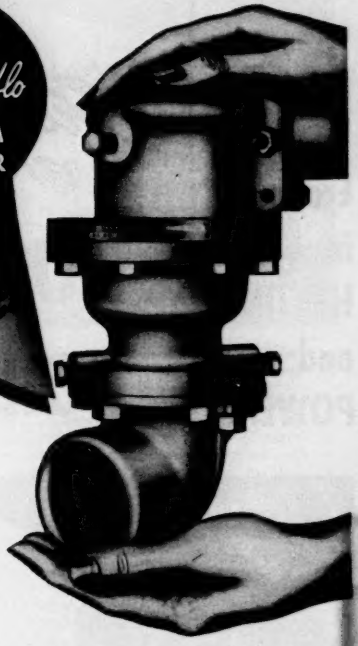

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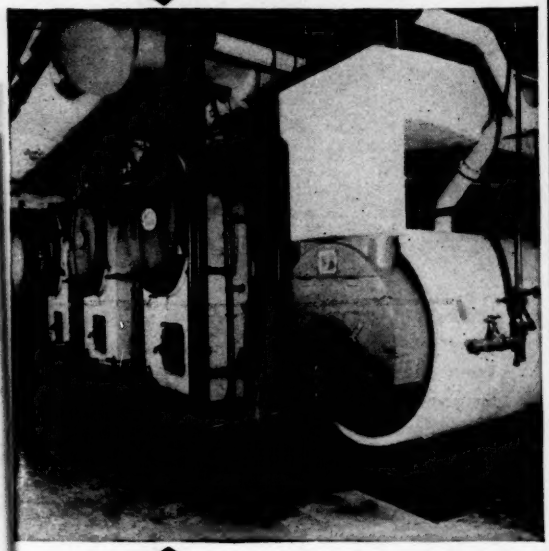

Compact, efficient layout distinguishes this Titusville boiler installation.

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INDUSTRY COMMITTEE

formed by heating and plumbing associations to aid government contact.

The national associations of the electrical, heating, piping, air conditioning and plumbing contracting industries announced February 5 the formation of a liaison committee of the mechanical specialty contracting industries for the furtherance of the national defense program.

The purpose of the liaison committee is to cooperate with the armed services and other branches of the government, the building construction industry and the Congress in all phases of the national defense effort. The committee represents the common interests of approximately 35,000 mechanical specialty contractors whose work involves approximately 50% of the dollar value of modern buildings.

• **MEMBERS.**—The liaison committee is composed of the top executives of three trade associations in the three mechanical specialty contracting industries. They are: National Association of Master Plumbers, V. J. Killian, Winnetka, Ill., president; and W. F. Clucas, Washington, D. C., executive secretary; National Electrical Contractors Association, Inc., Edw. Vanderlinde, Rochester, N. Y., president; and Paul M. Geary, Washington, D. C., executive vice president; Heating, Piping and Air Conditioning Contractors National Association, Wray M. Scott, Omaha, Neb., president; Joseph C. Fitts, New York, secretary. George B. Roscoe, director of Public Relations for the National Electrical Contractors Association, is secretary.

Announcing the formation of the joint group, the liaison committee said the mechanical specialty contracting industries have on their own initiative expanded their capacity to produce by three or four times during and since World War II.

"Mechanical Specialty Contracting Industries have the tools and equipment, the management, manpower and material sources, and are eager to do whatever job is required," the Committee said.

Four suggestions for furthering the defense program were made by the Committee, as follows:

(1) That full use be made of existing mechanical specialty contractor organizations having tools, equipment, technical and supervisory staffs who are now prepared to do the job, instead of allowing them to stand idle while inexperienced and inefficient high-cost organizations are developed.

(2) That job management functions and experience-tested industry practices be given full play and encouraged than suppressed or supplanted by arbitrary and unrealistic policies or procedures.

(3) That mechanical specialty contractors be assigned complete responsibility for the procurement of all equipment, material and labor required to accomplish their part of the project.

(4) That normal contracting procedures be followed to permit the awarding of the mechanical specialty work to established organizations of experience and proven capabilities.

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DeBothezat Bifurcator Roof Ventilators are ideal for exhausting abnormally hot air, corrosive, explosive or toxic fumes. Bifurcator Roof Ventilators operate with or without ducts. Compact and neat in appearance. Motors and fan wheels are readily accessible. Available with fan wheels from 12" through 48" in diameter, delivering up to 42,000 c.f.m.

6 DeBothezat Bifurcator Roof Ventilators provide both air intake and exhaust for "push-pull" system of plating tank ventilation. Photo courtesy of General Electric Company.

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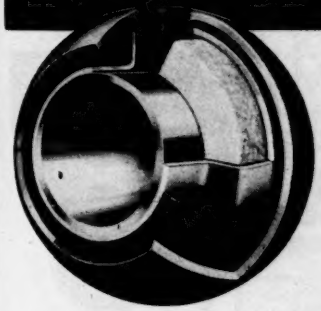

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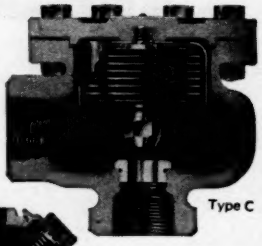

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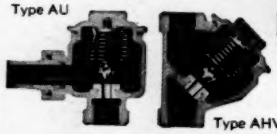

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News of the Month

• Construction activity in January was one-fifth higher than a year ago, the Building Materials Division, U. S. Department of Commerce and the U. S. Labor Department's Bureau of Labor Statistics reported jointly. The total value of new construction put in place amounted to nearly $2.1 billion, after a seasonal decline of 7% from December 1950 total.

COOLING TOWER INSTITUTE

formed by manufacturers with water conservation as primary objective.

The practical encouragement of all efforts, both governmental and private, toward the conservation of water as America's No. 1 natural resource has been announced as the primary objective of the newly formed Cooling Tower Institute, according to Raymond C. Kelly, President.

Other objectives of the Institute are to: (1) Support co-operative research toward improving the technology, design, and performance of industrial water cooling equipment; (2) coordinate recognized engineering groups in developing standardized testing procedures acceptable to manufacturers, users and technical groups; (3) Establish minimum standards of construction. Accumulate technical data of interest to both manufacturers and users of industrial water cooling equipment.

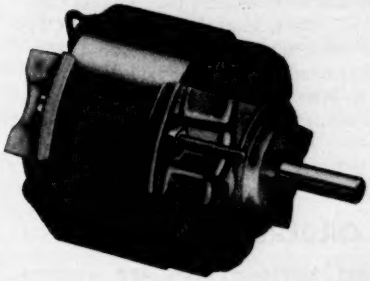
• **DEVELOPMENT.**—Speaking on the reasons for the formation of the Cooling Tower Institute, Mr. Kelly said, "Emerging in the early 1930's as a separate and distinct industry devoted directly to the conservation of water, the cooling tower industry has grown more than 10-fold in 20 years and today finds itself a full-fledged member in the family of major industries."

"Although the present membership of the Institute represents the majority of the manufacturing capacity for industrial-type equipment, we hope eventually to encompass the entire field of both evaporative water cooling and the newly developed air cooled heat exchangers. We have dedicated ourselves, for all industry, to furthering improvements in the technology, design and performance of equipment manufactured for efficiently dissipating to the atmosphere the waste heat developed in power production, chemical manufacture and other industrial processes."

• **ORGANIZATION.**—The Cooling Tower Institute was formally organized at a meeting held in Kansas City on August 10th, the charter membership being composed of seven manufacturers of industrial water cooling equipment. The member companies, their present delegates, and Cooling Tower Institute officers elected for the first term are:

The Fluor Corporation, Ltd., Los Angeles
J. R. Fluor, (first vice president, CTI)
Foster-Wheeler Corporation, New York
J. A. Brown, (second vice president, CTI)

FASCO FRACTIONAL H. P. MOTORS



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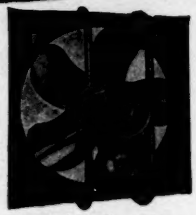

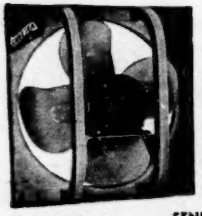

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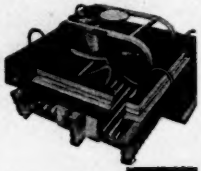

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Raymond C. Kelly, (president, CTI)
C. H. Wheeler Manufacturing Company, Philadelphia, H. R. Baker, Jr., (delegate, CTI).

NPA ORDERS

affect aluminum ducts and windows, copper tube, and commercial building alterations.

The National Production Authority, U. S. Department of Commerce, has ordered gradual elimination of the manufacture of aluminum windows and air ducts as a means of further conserving the strategic metal for the defense program.

NPA directed that residential-type aluminum windows and aluminum ducts used for heating, ventilating or air conditioning may be completed up to June 30 if their manufacture or assembly is begun by April 30.

Non-residential type aluminum windows may be completed up to June 30 regardless of when manufacture is commenced, provided that orders for them were received by the manufacturer prior to February 20.

• **RESTRICTED.** — Manufacturers may not use for making windows or ducts in the months of March, April, May or June more than 65% of their average monthly use of aluminum for the same purposes in the first half of 1950.

These items may not be manufactured or assembled after June 30.

NPA said it had extended the manufacturing period for these items to the greatest extent consistent with the needs of the mobilization program as a means of lessening the impact on manufacturers and their employees, to minimize difficulty in the construction of the large number of residential construction jobs recently undertaken, and to permit completion of the construction of windows and air ducts for many schools, hospitals and other buildings now under construction.

• **COPPER.**—Revision of the basic copper conservation order to permit the use of copper held in inventory after March 1 was announced February 19.

NPA explained that the amendment will permit businesses to make a more gradual adjustment to meet end-use restrictions of the order and will help to prevent dislocations in employment.

The revision also requires that purchasers of copper must certify that the metal will be used in compliance with NPA Order M-12 before delivery is made.

The action relaxes, at least temporarily, the previous restrictions on the use of copper tubing for hot and cold water systems in homes. This will facilitate the completion on schedule of many homes now under

construction that otherwise would not be completed, NPA said, because there is not enough galvanized water pipe available.

• **CONSTRUCTION.**—NPA revised on February 17 its basic construction order (M-4) to permit an increase in expenditures for alterations and additions to hotels and office and loft buildings.

These buildings now may be improved at a cost not to exceed 25 cents per square foot of the occupied space in a 12-month period. NPA emphasized that in computing this cost both actual construction and all other expenses or charges incidental to the work must be included in the total.

For all other buildings, the permitted expenditure for alternations and additions remains at $5,000 for the cost of actual construction in any 12-month period.

The amendment also provides that if partitions made in whole or in part of metal are to be used in any construction project, regardless of size or cost, special permission must first be obtained from NPA. Applications for such permission should be filed on form NPAF-24, available in all field offices of the U. S Department of Commerce.

SINCLAIR COAL

investigates new underground gasification method.

For the past three years the Sinclair Coal Company in cooperation with the Missouri School of Mines has been investigating a new method of underground gasification which is an addition to coal technology. It involves the use of electric current to form a channel in the coal seam through which air is passed for gasification.

• **ELECTRIC.**—To accomplish this, vertical bore holes are drilled and steel pipes are imbedded in the coal seam at intervals. The pipes have several functions. They serve as electrodes and as gas off-take or air-supply pipes. As demonstrated recently this is a two-stage method. First, electricity of appropriate voltage is passed between pipe electrodes, and the heat generated carbonizes coal in place with the formation of coal gas, and opens up the channel. Air is then forced down one electrode, through the channel in the coal, and emerges from another electrode as producer gas.

• **TEST.**—Information about the technique and typical test results were presented to a group of coal research men, representatives of technical schools, utility companies, and others, at a demonstration November 13, at Hume, Missouri. The test was made in a two-foot-thick seam of high-volatile bituminous coal. Mr. T. C. Cheasley is the coal company official who has been active in this project, and Mr. Eric Sarapuu is in direct charge of the field tests.

The objective of the work to date has been to establish workable methods and equipment, and to provide basic data on electric break-through, carbonization of coal between electrodes, and subsequent gasification by

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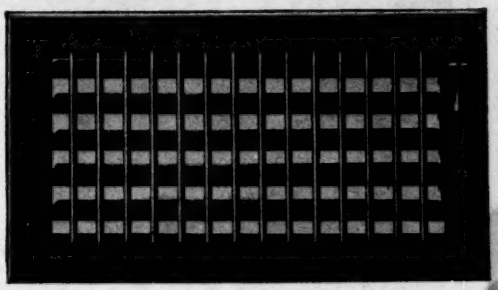


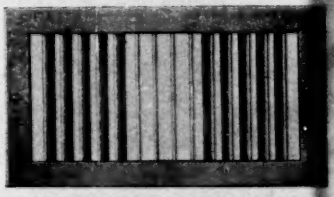
1008V-HML. Single bank of bars, multi-louvre valve.

Full flexibility for multiple deflection is furnished by these Streamliner registers and grilles. They provide correct diffusion for high velocity outlets in air conditioning, ventilating or cooling systems.

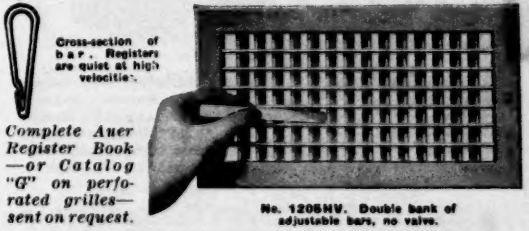
Bars are hollow moulded, beveled, perfectly formed, and smooth in contour. They are pivoted in the frame on special split sleeves, or expansion inserts, which furnish proper tension to hold bars firmly when set, yet allow easy adjustment to the desired angle with one simple tool. Bars are slightly "tear-drop" shaped like an airplane wing in cross-section, and pivoted at the exact center, so they can be turned completely around. Some users prefer to turn the thin edge outward for outlets (and the broader edge toward the flow of air) cutting resistance and turbulence to a minimum. Bars may be set at any angle, in any groupings. Shutters of multi-louvre valves are pivoted on rivets to prevent vibration. All Streamliner registers are equipped with gaskets. Write for Folder S-49 with sizes and list prices.

8 MODELS

The Series includes models with single bank of adjustable bars (vertical or horizontal), also with double bank of adjustable bars (vertical in front and horizontal in back, or the reverse), also all above four types with the addition of horizontal multi-louvre valves in the rear, controlled by lever on face of register.



No. 1008V. Grille only, with single bank of adjustable bars.



Cross-section of bar. Registers are quiet at high velocities.

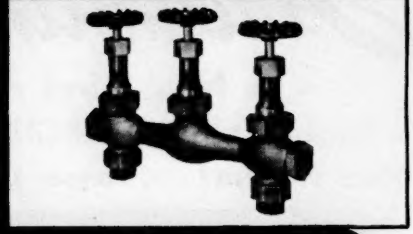
Complete Auer Register Book —or Catalog "G" on perforated grilles— sent on request.

No. 1208HV. Double bank of adjustable bars, no valve.

THE AUER REGISTER CO., 6600 Clement Avenue, CLEVELAND 5, OHIO

Auer REGISTERS & GRILLES for AIR CONDITIONING & GRAVITY

The Compactness of
HONEYWELL BY-PASSES



will simplify your piping

The Honeywell By-Pass is a compact, neat, easily-installed means of by-passing control valves, traps and other pressure units. It simplifies piping arrangements by eliminating a multitude of joints, nipples and elbows . . . by using a minimum of space . . . by saving time . . . by minimizing maintenance.

Available in Bronze as follows: sizes ½ to 2 inches . . . Bronze or Stainless trim . . . union bonnet . . . screwed ends . . . 150-300 lbs. . . . from $21 to $116. Available in Cast Steel as follows: 1 to 2 inches . . . union bonnet for 1" and 1¼", bolted bonnet for 1½" and 2" . . . Stainless trim . . . screwed or flanged ends . . . 300-600 lbs. . . . from $228 to $426. Send in your order, today!

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 1913 Windrim Ave., Philadelphia 44, Pa. Offices in more than 80 principal cities of the United States, Canada and throughout the world.

Honeywell
VALVE PRODUCTS

Just a breeze

. . . keeps **Western Rotary Turbine Ventilators** in operation, providing constant 'round-the-clock exhaust. Western's lifetime-guaranteed bearings are both mounted on the same axis . . . always stay in alignment . . . stand up to shipping jolts. Throat sizes from 6" through 48". The typical, clean, attractive silhouette that progressive industry demands. Western turbo-ventilation . . . high in efficiency, low in cost.

Request our catalogue for information, sizes, capacities, price lists. In 1951 Sweets and A. E. C. Jobbers are invited to participate in our national sales system.

"Always on the job—never on the payroll"

WESTERN ENGINEERING & MFG. CO.
1726-28 E. WASHINGTON BLVD. LOS ANGELES 21, CALIF.

passing air through the channel opened by electric heating.

During the electrocarbonization stage a gas of 500 to 650 Btu per cu ft is given off. This gas contains about 15% methane and other hydrocarbons, 50% hydrogen, 15 to 18% carbon monoxide, 6 to 8% carbon dioxide, plus hydrogen sulfide, tar vapors, etc., at a carbonizing temperature of 800 to 900C. The passage of air was said to yield a producer gas of 120 to 150 Btu per cu ft. The yield and richness of total gas will, of course, depend upon the proportion of coal gas resulting from electrical carbonization and of producer gas made by gasification with air. The results presently available do not represent a complete cycle of carbonizing and gasifying all the available coal between electrodes, and therefore cannot be used as a basis for making conclusive computations.

The sponsors state that the tests have not yet established the practical economics of this interesting new process.

TEXAS GAS

embarking on underground storage program to meet expanding demands for gas.

Texas Gas Transmission Corp. is embarking on a $939,000 underground gas storage program to meet demands for natural gas in its mid western service area.

• **PEAK BOOST.**—The long-distance transmission company, which earlier announced a $42.3 million pipe line expansion, asked the Federal Power Commission to authorize the development of the Alford underground storage field near Petersburg, Indiana, which would enable Texas Gas to supplement its peak deliveries of natural gas by 30 million cubic feet a day.

When completed, the Alford Storage Field will hold 4 billion cubic feet of gas. Texas Gas now operates a storage field at Oaktown, Indiana, capable of delivering 6 million cubic feet a day. Additional storage plans, the company said, will be announced in the future.

Work on the Alford Storage project can begin about March 1, the company said, so that necessary construction work may be completed and gas injected during the summer months. The project must be completed and the field repressured by this coming November so that gas from storage will be available to meet peak day demands during the winter of 1951-1952.

PROTECTIVE COATINGS TESTS

to be done by NBS in new durability laboratory.

A special laboratory, recently designed and constructed by the Building Technology Division of the National Bureau of Standards, eliminates the major difficulties that have in the past led to anomalous re-

sults in the accelerated durability testing of exterior covering materials. Developed primarily for studying organic coating materials, such as asphalts, tars, and paints, the new facilities are sufficiently flexible to meet the requirements of most materials exposed to weathering.

• **CONTROL.**—Materials intended for outdoor use are frequently exposed in the laboratory to regular cycles of artificial sunlight, heat, and water for the purpose of hastening their deterioration. Although such exposure—called accelerated weathering—is generally accepted as a means for determining the relative resistance of similar materials to weathering, results obtained by different laboratories, and even by the same laboratory, do not always show good agreement. This lack of correlation results from variables inherent in the testing procedures that have in the past been largely uncontrolled. These include solids content of the water supply, fluctuations in the light intensity, and irregular operation of the system due to failure of one or more functions while the others continue to operate.

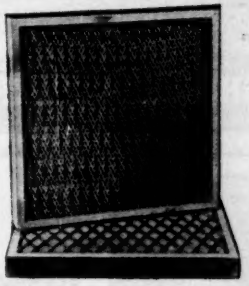
Automatic control of all functions, and of the temperature and purity of the water within narrow limits, assures uniform operation at all times of the Bureau's improved accelerated weathering laboratory. The room, 16 by 25 feet in size, is maintained within one degree of any desired working temperature. The relative humidity is not controlled directly, but remains in the range of 40% to 60% as a result of the subcooling of fresh air brought into the room. The floor area is divided into three portions: a central working space and two areas enclosed in hoods to house the testing machines.

In one hood are six machines built at the Bureau to utilize the enclosed carbon arc as a source of light. The operating range of each light is regulated at 130 to 145 volts and 15 to 17 amperes by means of chromel C ballast resistors in series with the arc. An aluminum drum 31 inches in diameter and holding sixty exposure panels (2¾- by 6-inches) is rotated around each arc at a rate of one revolution per minute. Air at ambient conditions is circulated around the panels at a low velocity until they reach a predetermined maximum temperature. At this time a thermo-sensitive element mounted in one of the panels turns on the high speed blower, which materially increases the air flow and thereby reduces the panel temperatures. Deionized water, controlled by a cycle clock, can be sprayed on the test panels for any portion of their exposure period.

The heart of each machine is a time-delay relay which turns off all functions of that machine if the arc should cease to operate for a period in excess of 30 seconds. Voltage and current are continuously indicated, while the running time and power consumed by the arc are recorded by suitable instruments on each machine. Wiring circuits have been designed to take advantage of the 2% voltage control supplied the Bureau.

The other hood encloses a modified commercial open-drum Atlas Weatherometer, two twin-arc Weather-

For Air Conditioning, Heating and Ventilating



Greater efficiency — lower resistance is yours with an AIRSAN Air Filter.

A permanent, cleanable viscous type filter of all galvanized construction, having full bronze welded corners. Expanded metal face plate acts as lint arrestor to provide easier cleaning and servicing. Rated filtering efficiency 98.5%. In standard 1" and 2" thickness.

Also available for heavy duty service on industrial and special applications — in 2" to 4" thickness. Holding frames (for V-type or straight banks) are made for all type filters.

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A Few Distributorships Available. Write for Details.
Canadian Representative: DOUGLAS ENGINEERING CO., Ltd. Montreal

Airsan

MASSACHUSETTS
PRESENTS
THE NEW
MASSACHUSETTS
AIR CONDITIONING
UNITS
SEVEN SIZES .....
available, ranging from
1,000 to 14,000 C.F.M.
Designed to combine
cooling in summer,
heating in winter.
Built in sections - Vertical or horizontal mounting.
Various combinations and arrangements of discharge and by-pass damper.
Write for catalogs.
MASSACHUSETTS BLOWER DIVISION
The BISHOP & BABCOCK Mfg. Co.
4901 HAMILTON AVENUE CLEVELAND 14, OHIO

STAXAUSTER can be used to convert all types of roof ventilators into powerful exhaust or air supply units.
Allen
EXHAUST FANS
Allen-engineered Exhaust Fans are efficient, easy to install, and economical to operate. The Fan Section shown above and the Remote Drive Staxauster present a range and diversity that enable you to solve almost any ventilating problem. For your wall installation needs, Allen Exhaust Fans and Lo-Noiz-Level Multiblade Fans are recommended. Advanced engineering design, skilled workmanship, and quality materials make Allen Exhaust Fans outstanding in the ventilating field. Our representatives are in most principal cities; names listed in our catalog in Sweet's Architectural File, Section 20b.
Remote Drive
Allen Staxauster
Specially designed for applications handling corrosives and/or high-temperature air.
Write for catalog on complete line of roof ventilators.
ALLEN ENGINEERED VENTILATION
PRODUCTION PLANNING CO.
ROCHESTER, MICHIGAN
Roof Ventilators for Every Commercial and Industrial Need

ometers, and an Everready X-1A machine. These are controlled in a manner similar to that of the other machines.

• **AIR CONDITIONED.**—An air conditioner of tremendous size would be required to control the temperature of the space around all 10 machines, which dissipate 39 KVA of energy. This temperature is therefore regulated by blending various amounts of outside corridor air with conditioned air. The resultant mixture is distributed to the machines in each hood by a 2,000 cfm blower with a proportioning damper in its intake plenum. The blended air is distributed in turn to the vicinity of each machine by aluminum ductwork. Further conditioned air is drawn through a two-inch opening running along the floor of each of the hoods by an exhaust blower on the hoods which removes about 30% more air than is delivered by the ducts.

Water-conditioning equipment, located on a balcony above one of the hoods, delivers recirculated, deionized water with about 1 ppm of dissolved solids at any desired temperature.

Getting Personal

G. M. Babcock (co-author, *Heat Reflected and Conserved by Aluminum Paint Coatings*, page 68) was born and educated in Brooklyn, N. Y. He received his technical education at Pratt Institute, Columbia University and the College of the City of New York.

Mr. Babcock served as consultant for Conant Carbon Co., Montreal, Quebec; president of Verna Products Inc., New York City; chief of service engineers, Flintkote Co. In 1936 he joined the Reynolds Metals Co., New York, in the Sales Service Department, and he has been with them ever since.

He is co-author with F. B. Rethwisch of a number of articles that were published in chemical and technical magazines. He has been granted a number of patents, and several applications for patents are now pending.

G. M. Babcock

F. B. Rethwisch

F. B. Rethwisch (co-author, *Heat Reflected and Conserved by Aluminum Paint Coatings*, page 68) is chief chemist, Pigment Division, Reynolds Metals Co., Louisville, Ky. Born in Louisville, Ky., he received his B.S. degree from the University of Louisville. He continued graduate studies at the University of Louisville, University of Wisconsin and received his M.S. in Chemistry from Purdue University.

During the period of 1930-38 he was in charge of the science department, Anchorage High School, Anchorage, Ky. In 1938 he joined the Pigment Division, Reynolds Metals Co., Louisville, Ky. His present work consists of the con-

trol and development of new products, research and sales service.

He has been granted a number of patents and applications for others are now pending.

Mr. Rethwisch is a member of the Honorary Chemical Society, Theta Delta Chi, Chemistry Club, Production Club, and American Chemical Society.

D. G. Hudson

Duncan G. Hudson *(Theory and Practice of the Fog Filter Air Scrubber*, page 57) graduated from Michigan State College in 1928. After graduation he was employed as Factory Sales Representative for the Reo Motor Car Company and then in various automotive and airplane engine design capacities for the Reo Motor Car Company, Buick Div. G.M.C. and Continental Motors Corporation.

In 1942, Mr. Hudson was appointed Sales Manager to develop a market for low capacity high pressure pumps by the John Bean Division, F.M.C.C., where he first became interested in the potential use of high pressure water fog as a means of wetting many hard-to wet dusts and fumes.

To develop collecting equipment associated with that phenomenon, Mr. Hudson became associated with The R. C. Mahon Company, Detroit, Michigan, in 1950 as chief engineer of the fume and dust control division.

E. D. Sallee (co-author, *Application of Down-Draft Exhaust Ventilation*, page 61) is an industrial hygienist with the American Can Co. He was born in Parsons, Kansas, and received his B.S. degree in chemistry in 1936 from the University of Iowa. In 1937 he joined the research division of the American Can Co. as an analytical chemist. Since 1947 he has been supervisor of the industrial hygiene group in the research division located at Maywood, Illinois. He is co-author of various articles dealing with food technology and with industrial hygiene. Mr. Sallee is a member of A.C.S. and A.P.H.A. and is president-elect of the Chicago Section of A.I.H.A.

E. D. Sallee

R. B. Carter

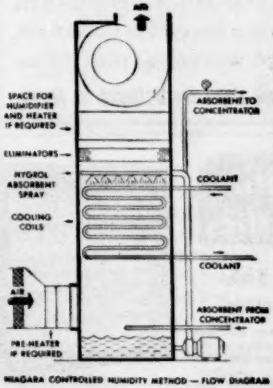
Robert B. Carter (co-author, *Application of Down-Draft Exhaust Ventilation*, page 61) was born in Lexington, Kentucky in 1907 and received his college training at the University of Kentucky. After graduation with B.S. and M.E. degrees in 1928 he joined the Charles Hartman Co. as a sales engineer specializing in heating, ventilating and air conditioning problems. He continued with this work until 1940 at which time he joined the American Can Company's engineering department. As a designer and ventilation engineer he worked with this company until his untimely death of a kidney ailment on July 19, 1950. During World War II he did considerable engineering work in his usual meritorious manner for the Amertorp Corporation's torpedo manufacturing plants located at St. Louis and Forest Park, Illinois. He was a licensed professional engineer warmly respected and widely known in the ventilation engineering field.

New "Controlled Humidity" Method Gives a Better Solution to Air Conditioning Problems

"Hygrol" Absorbent Liquid Dehumidifies Fresh Air Without Refrigeration

● NIAGARA Air Conditioners or Dehumidifiers using "Hygrol" liquid absorbent give precise control of air temperature and humidity . . . at lower operating cost, with large savings in space and with smaller and less expensive equipment, in many applications.

This method dehumidifies the air by passing it through a chamber in which "Hygrol" spray removes its moisture and produces a low dew point. The "Hygrol" solution resulting is continuously and automatically re-concentrated, providing always full capacity in air conditioning and assuring always a constant dehumidifying capacity and a trustworthy, constant condition for your material, apparatus, process or room to be conditioned.



NIAGARA CONTROLLED HUMIDITY METHOD — FLOW DIAGRAM

"Hygrol" is a liquid, not a salt solution; it stays pure and non-corrosive; does not cause maintenance or operating troubles in food plants or in chemical processes.

Investigate this new Method for "comfort" air conditioning as well as to protect quality in hygroscopic material, or processes or instruments, or to prevent condensation damage to metals, parts or products.

Write for Bulletin No. 112

NIAGARA BLOWER COMPANY

Over 35 Years of Service in Industrial Air Engineering

Dept. HV, 405 Lexington Ave. New York 17, N. Y.

Experienced District Engineers in Principal Cities

WET WATER

FOR DUST CONTROL WITHOUT CAPITAL INVESTMENT

AQUADYNE "4-Way" Wet Water spreads, diffuses and makes intimate contact with powder-size particles many times faster than ordinary water. In any dust wetting or product blending situation, a *smaller* amount of wet water will do a *better* job.

The AQUADYNE System provides wet water right on tap, automatically mixed without hard-to-get pumps, motors or storage tanks. Any ordinary water supply, hooked up to the HYDROBLENDER blends as required with the AQUADYNE multiphase wetting compound capsule. Each capsule gives you 1,000 gallons of wet water at less than ½ cent a gallon.

ADDRESS DEPT. V3 FOR THESE FREE BROCHURES:
"THE THEORY OF WET WATER"
"CONTROLLING DUST IN INDUSTRIAL PLANTS"

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EFFICIENT, LOW COST AIR REMOVER

Muckle VENTS
POWER DRIVEN ROOF EXHAUSTER

For stores, cafes, bakeries, laundries, garages, etc. Built to function in wet air—motor is out of line of air flow. A compact, sturdy, easy-to-install package unit. Sizes 370 to 13,080 C.F.M. air delivery. Fits any roof. *Write us about YOUR problem.*

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Elgo Ventilating Specialties

You'll Prefer This Automatic Shutter

The "Elgo" gets the preference because of its outstanding features—such as its quick-opening, its tight-closing and the absence of blade flutter. Its weather-stripping and felt silencing pads are other notable features. Sizes from 8" to 72" square—also rectangular.

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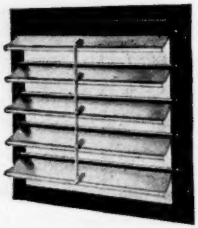

"ELGO" TYPE AUTOMATIC SHUTTER
Front View (Open)

Free CATALOG

ELGO SHUTTER & MANUFACTURING CO.
2738 W. Warren Detroit 8, Mich.

INDUSTRIAL DEGREE-DAYS
January, 1951

City	55F Base	45F Base
Baltimore, Md.	499	234
Buffalo, N. Y.	814	515
Chicago, Ill.	886	577
Cleveland, Ohio	770	477
Detroit, Mich.	838	528
Indianapolis, Ind.	795	498
New York, N. Y.	567	281
Philadelphia, Pa.	539	261
Pittsburgh, Pa.	612	339
St. Louis, Mo.	676	395

Canadian Degree-Days for January, 1951*

City	January		Cumulative Sept. 1 to Jan. 31	
	1951	Normal	1950-51	Normal
Calgary, Alta.	1738	1609	5788	5311
Charlottetown, P.E.I.	1290	1463	3953	4328
Crescent Valley, B. C.	1345	1352	4351	4631
Edmonton, Alta.	1798	1814	6281	5798
Fort William, Ont.	1891	1807	5965	5622
Grande Prairie, Alta.	2158	1841	6939	6000
Halifax, N. S.	1045	1283	3319	3898
London, Ont.	1277	1336	4135	4013
Medicine Hat, Alta.	1786	1643	5370	5032
Moncton, N. B.	1349	1528	4183	4714
Montreal, P. Q.	1495	1552	4437	4648
North Bay, Ont.	1714	1658	5352	5161
Ottawa, Ont.	1539	1646	4719	4923
Penticton, B. C.	1147	1184	3642	3810
Porquis Junction, Ont.	1972	2052	6310	6300
Prince George, B. C.	1767	1615	5901	5372
Quebec City, P. Q.	1562	1696	4647	5207
Regina, Sask.	2148	2037	6611	6373
St. John, N. B.	1234	1417	3895	4386
Saskatoon, Sask.	2226	2027	6803	6276
Toronto, Ont.	1152	1304	3601	3948
Vancouver, B. C.	890	893	2981	3061
Victoria, B. C.	826	815	2845	2725
Windsor, Ont.	1184	1283	3754	3729
Winnipeg, Man.	2103	2111	6362	6316

*These data are supplied through the courtesy of the Meteorological Division, Air Service Branch, Department of Transport, Canada.
The Department reports a slight revision in the figures for December as published in last month's issue. Corrected figures are: Quebec City, P. Q., 1333; Montreal, P. Q., 1340.

COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available.

IRON AND STEEL CONFERENCE — Two-day conference on Instrumentation for the Iron and Steel Industry, in Pittsburgh, Pa., sponsored by the Pittsburgh Section of the Instrument Society of America and the Carnegie Institute of Technology. L. M. Susany, general chairman, Carnegie Library, 4400 Forbes St., Pittsburgh, Pa. ..... **MARCH 28-29, 1951.**

ASME MEETING—Spring meeting of the American Society of Mechanical Engineers, at the Hotel Atlanta-Biltmore, Atlanta, Ga. C. E. Davies, secretary of the Society, 29 W. 39th St., New York, N. Y. ..... **APRIL 2-5, 1951.**

OIL HEAT EXPOSITION—19th National Oil Heat Exposition, at Navy Pier, in conjunction with the 28th annual convention of Oil-Heat Institute of America, at the Palmer House, Chicago, Ill. C. F. Curtin, secretary, 6 East 39th St., New York 16, N. Y. ..... **APRIL 2-6, 1951.**

POWER CONFERENCE—14th annual Midwest Power Conference, sponsored by Illinois Institute of Technology, at Hotel Sherman, Chicago. Conference director, Roland A. Budenholzer, at Illinois Tech, Technology Center, Chicago 16, Ill. ..... **APRIL 4-6, 1951.**

REFRIGERATION AND AIR CONDITIONING EXHIBIT—1951 Eastern Refrigeration and Air Conditioning Educational Exhibit and Conference, sponsored by the Refrigeration Equipment Manufacturers Association and Refrigeration Service Engineers Society, to be held at Hotel Statler, Buffalo, New York. George E. Mills, public relations director, REMA, 1346 Connecticut Ave., N. W., Washington 6, D. C. ..... **APRIL 6-8, 1951.**

LUBRICATION SHOW — Annual convention and lubrication show of the American Society of Lubrication Engineers, at the Bellevue-Stratford Hotel, Philadelphia, Pa. W. F. Leonard, secretary of Society, 343 South Dearborn Street, Chicago 4, Ill. ..... **APRIL 16-18, 1951.**

FOUNDRYMEN'S CONVENTION—55th annual convention of the American Foundrymen's Society, in Buffalo, New York. William W. Maloney, secretary-treasurer of the Society, 616 S. Michigan Ave., Chicago 5, Ill. ..... **APRIL 23-26, 1951.**

REFRIGERATION MEETING—Annual meeting of the Refrigeration Equipment Manufacturers Association, at The Homestead, Hot Springs, Va. George E. Mills, public relations director, REMA, 1346 Connecticut Ave., N.W., Washington, D. C. ..... **APRIL 30—MAY 2, 1951.**

ANTHRACITE CONFERENCE—9th annual Anthracite Conference at Lehigh University, Bethlehem, Pa. Prof. A. C. Callen, conference chairman, Lehigh University..... **MAY 4-9, 1951.**

ARCHITECTS CONVENTION—1951 convention and national seminar meetings of The American Institute of Architects, at the Edgewater Beach Hotel, Chicago, Ill. Paul Gerhardt, Jr., chairman, 121 No. LaSalle St., Chicago, Ill. **MAY 8-11, 1951.**

CONTRACTORS MEETING—62nd annual convention of the Heating, Piping and Air Conditioning Contractors National Association, at the Shoreham Hotel, Washington, D. C. Jos. C. Fitts, secretary of Association, 1250 Avenue of the Americas, New York 20, N. Y. ..... **MAY 8-11, 1951.**

ASRE MEETING—Spring meeting of the American Society of Refrigerating Engineers, at Hotel Statler, Detroit, Mich. M. C. Turpin, secretary, 40 West 40th St., New York 18, N. Y. ..... **MAY 27-30, 1951.**

NDHA MEETING—42nd annual meeting of the National District Heating Association, at the Statler Hotel, Detroit, Mich. John F. Collins, Jr., secretary-treasurer of the Association, 827 N. Euclid Ave., Pittsburgh 6, Pa. ..... **JUNE 5-8, 1951.**

ASME MEETING—Semi-annual meeting of the American Society of Mechanical Engineers, at Hotel Royal York, Toronto, Ont., Canada. C. E. Davies, secretary of the Society, 29 West 39th St., New York, N. Y. ..... **JUNE 18-22, 1951.**

STOKER MEETING — 1951 annual meeting of the Stoker Manufacturers Association, at South Shore Inn, Lake Wawasee, Syracuse, Ind. Marc G. Bluth, executive secretary of the Association, 307 North Michigan Avenue, Chicago 1, Illinois. ..... **JUNE 25-26, 1951.**

REFRIGERATION CONGRESS—Eighth International Congress of Refrigeration, under the auspices of The International Institute of Refrigeration, to be held at Church House, Westminster, London, England. The Secretary, Dalmeny House, Monument St., London, E. C. 3. ..... **AUGUST 29—SEPTEMBER 11, 1951.**

INSTRUMENT CONFERENCE AND EXHIBIT—1951 Instrument conference and national exhibit of the Instrument Society of America, at the Coliseum, Houston, Tex. John McCaffery, assistant executive secretary of the Society, 921 Ridge Ave., Pittsburgh 12, Pa. ..... **SEPTEMBER 10-14, 1951.**

AGA CONVENTION—33rd annual convention of the American Gas Association, at Kiel Auditorium, St. Louis, Mo. Secretary of the Association, 420 Lexington Avenue, New York 17, N. Y. ..... **OCTOBER 15-17, 1951.**

REFRIGERATION SHOW—7th All-Industry Refrigeration and Air Conditioning Exposition, at Navy Pier, Chicago, Ill. Show director, REMA, 1346 Connecticut Ave., N.W., Washington, D. C. ..... **NOVEMBER 5-9, 1951.**

PEANUTS ARE GREAT FOR ELEPHANTS

but Air Conditioning Dealers thrive on Profits

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says

TYPHOON

No wringing of hands or crying in their beer by Typhoon dealers. They make money on air conditioning—year in, year out. For Typhoon's policy is: "every dealer must prosper." And Typhoon makes good on this policy with a brass tacks program that brings in more dollars for dealers.

TYPHOON 5-Way PROFITS PLAN

1. Typhoon, America's No. 1 specialist in packaged air conditioners, brings you the most complete line of units in the quick-profit range — 1½-2-3-5-7½-8-10-15 and 20-tons. There's a size for every job!
2. Typhoon units are engineered to deliver full rated capacity even after years of hard service. This means minimum servicing, maximum profits and good will.
3. Typhoon delivers air conditioning at the lowest dollar cost per ton capacity—value that means full markup for you.
4. Typhoon district managers give you 100% sales cooperation, with practical in-the-field training for your sales force.
5. Typhoon units are backed by 42 years of experience in the air cooling field . . . and by an advertising and promotion program that produces a steady flow of leads for you.

Want to know about the finest dealer setup in the business? Write us today.

TYPHOON AIR CONDITIONING CO., INC.

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Fig. 0611, IBBM Wedge Gate Valve, Working Pressures: 125 lbs. Steam, 200 lbs. WOG.

KENNEDY JOB-FITTED

Iron-Body Wedge Gate Valves

YOU SAVE TIME AND MONEY all along the line with Kennedy iron-body wedge gate valves because they are JOB-FITTED . . . every valve specially designed and engineered for the job it has to do.

THE WEDGE DISC is a cored casting of thick metal section, reinforced by integrally-cast interior posts and provided with openings to drain in any position.

HEAVY BRONZE DISC RINGS are forced into dovetailed grooves in the disc in a practically inseparable construction.

HIGHER STRENGTH IRON in the body and bonnet is actually 50% stronger than ordinary cast iron . . . and far exceeds A.S.T.M. requirements.

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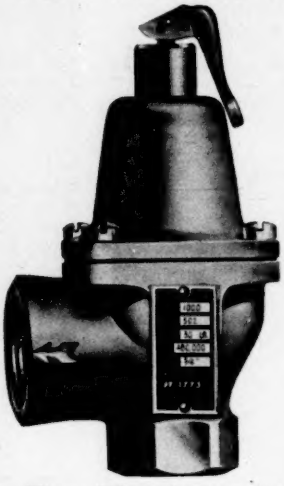

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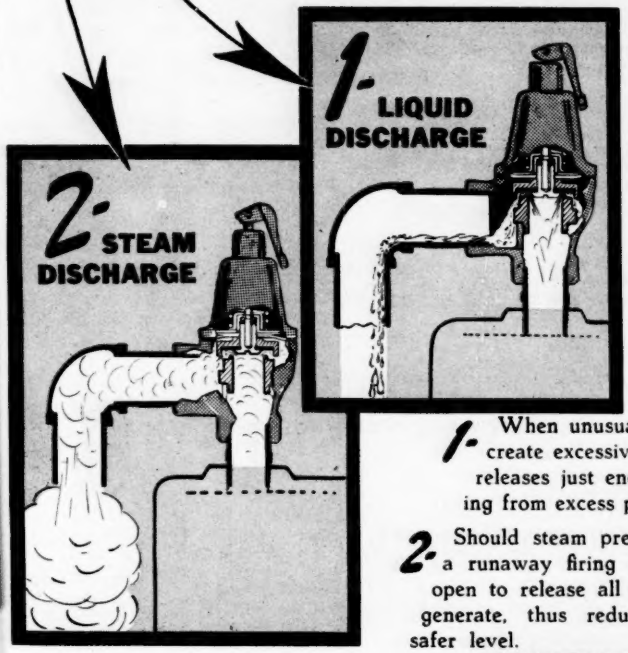

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(Continued from last month's Reference Data)

Photographic Film and Paper Manufacture

Air control is most important in the manufacture of photographic film and paper. Steps are taken to provide dust-free conditions and to prevent the development of microscopic growths. Air conditions maintained in the various rooms are given in Table 12.

All air is washed with water sprays to which an algae inhibitor is added. Air is filtered through glass wool, air mat paper, or electrostatic filters. All make-up air is filtered through metal filters. Make-up air that is used for film drying is passed through activated carbon filters to absorb any harmful fumes that may be present in the air.

TABLE 12—AIR CONDITIONS IN PHOTOGRAPHIC FILM AND PAPER MANUFACTURE

Room or Process	Temperature, F	Relative Humidity, %
Drying	20-125	40-55
Cutting and packing	65-75	45-70
Film base and paper storage	70-75	40-65
Coated paper and film storage	70-75	45-65

Photographic Film Storage

Temperature and humidity conditions in motion picture film storage vaults should be such as to insure maximum life for photographic emulsions which, because of their nature, undergo gradual deterioration as they age. Vaults should be cool and dry. Temperatures of 65-70F with a relative humidity of 40-55% meet the storage requirements of most films. While lower temperatures and humidity would be conducive to longer film life, the conditions mentioned are considered satisfactory except for special products for which the manufacturer may recommend other air conditions. These figures are for both raw stock storage and for the storage of developed film. Unless properly stored, developed film may become brittle.

By maintaining general laboratory conditions the same as those under which the raw stock is stored, there is no time lag in bringing the film to equilibrium with laboratory conditions before use. However, other factors may influence design conditions. Operator comfort suggests a slightly higher temperature, say 70-75F. It may be necessary to maintain relative humidity at 65-70% to minimize the static which is sometimes encountered in handling film in a too-dry atmosphere. Because of the static electricity problem, a relative humidity below 40% should be avoided.

Another authority recommends that motion picture laboratories and film storage vaults be kept at 70F and 55-65% R. H. He points out that while vault temperature could be lower, it should not go low enough to cause condensation on the film when it is brought out to an area having normal room conditions.

A third authority suggests the figures given in Table 13:

TABLE 13. MAXIMUM RECOMMENDED TEMPERATURES FOR FILM STORAGE

Type of Film	Storage Periods Up to 1 Month	Storage Periods Up to 6 Months
	Maximum Temperature, F	
Black and white negative and sound	65	50
Black and white positive	75	65
Color	65	50

Plywood

Building up the laminations for plywood may be done by cold pressing or hot pressing. For cold pressing, the air should be maintained at 90F and 15-25% R. H. For hot pressing with resin film, it should be 90F and 60% R. H.

Poultry Incubation

According to one well versed in poultry husbandry, most of the large forced draft incubators for incubation of chicken, duck and turkey eggs operate at a temperature of 99.5-100F and a relative humidity of 54-56%. At hatching time, the temperature is usually dropped one-half a degree or a little better, and the humidity is allowed to rise.

Fumigation is used about two to three times during the last two days of incubation—that is, on the twentieth and twenty-first days. A mixture of formaldehyde and potassium permanganate is used to control pullorum disease and omphalitis or navel ill.

Table 14 was drawn from data supplied by another poultry specialist.

No mention was made of air conditions in laying quarters because such conditions vary with the seasons. In summer months, it is desirable to have a maximum of ventilation, regardless of temperature; in winter, to avoid condensation on the interior walls, an attempt is made to hold the temperature to 10F over or below the outside temperature. This procedure applies to houses which do not have forced ventilation systems.

TABLE 14—AIR CONDITIONS FOR POULTRY INCUBATION

Room or Process	Temperature, F	Relative Humidity, %
Incubator room	70 - 75	30 - 40
Brooder house		
1st week turkeys and chickens	70 - 75	60
After 1st week	50 - 60	40
Battery rooms		
Starting chicks or turkeys	70	70 - 75
Growing chicks or turkeys	50 - 60	50 - 60
Egg storage rooms	45 - 60	70 and up

AIR CONDITIONING DESIGN CONDITIONS – INDUSTRIAL PLANTS

Precision Manufacturing

The last World War brought out the importance of maintaining standard air conditions in gage rooms so that parts manufactured in several plants could be assembled to form one machine or unit. Most of the industrial nations have adopted 68F or 20C as the standard temperature for gage rooms. This figure was selected because it is a reasonable room temperature that is fairly easy to maintain; it is expressed as a whole number on whichever of the two temperature scales that is used; and it was adopted in some plants turning out metric gages.

This standard condition for gages has made possible a very close tolerance. For example, during World War I, 0.002 inch was considered a close tolerance; during World War II, a tolerance of 0.0002 inch was not unusual and was required on many government specifications.

Relative humidity is maintained at 40-50%, and dust control is necessary for a quality product.

Air conditions are controlled in all rooms where watches are assembled. Temperature is held within the range of 72-75F, with a maximum relative humidity of 50%. Filters are used in the air circulating system to keep down dust. In the manufacturing divisions, the only rooms air conditioned are the mainspring department and the dial department. Temperature is held within a range of 72-75F mainly for comfort. However, in the manufacture of mainsprings, relative humidity is held to below 50% to control corrosion. By keeping down the relative humidity to 50% in the room where watch dials are lacquered and printed, many manufacturing troubles are eliminated. Previous to air conditioning, there were difficulties due to high humidity, particularly during the summer.

Printing

Difficulties experienced in printing establishments operating under normal conditions are primarily caused by use of hygroscopic materials, although there are equipment problems, too.

The exact air conditions that are employed are not as important as the consistency with which such conditions are maintained. Whatever conditions are selected must be maintained both during winter and summer. While a lower temperature and relative humidity would be more economical in winter, such values would be more difficult to maintain in summer. Where winter temperature is so low that excessive sweating may occur at 40% R. H., double glass windows or glass block windows have proven effective.

One engineer selected 77F and 50% R. H. as the best year-round condition. Another printing authority suggests 80F and 50% R. H. as the condition to be maintained when it is 90F outside.

Not only is it important to have correct consistent conditions so that accurate registration may result in color printing, but controlled conditions help wood-mounted engravings to be at their correct printing height at all times.

Air humidification in winter is best achieved by spray type air washers; silica gel for dehumidification.

For multi-color printing, air should be at 82F and 45% R. H. For photo-gravure printing, it should be 72F and 50% R. H.

Textiles – Knitted Wear

Recommended relative humidities for knitting mills are given in Table 15.

For knitting nylon, a relative humidity of 48% is recommended. If relaxation of the yarn is a problem, then 70% R.H. should be maintained.

The relative humidity percentages of Table 15 are based on a temperature of 70F.

According to U. S. Government tests, when the relatively humidity of the air is over 45%, static cannot exist. This allows material to run freely on high speed machinery without the danger of jumping due to electrification. When the yarns run moist they are pliable and tend to run without cracking off of the small fibers.

Rust will not set in when the atmosphere is kept under 70% R. H. Relative humidity can be kept well below this figure and still high enough for better working of the yarns. The change-over from haphazard atmospheric conditions to controlled air conditions is claimed to lessen the amount of breakages and seconds in a mill at least 25%, and the productivity of the mill increased from 3 to 8%.

TABLE 15—RECOMMENDED RELATIVE HUMIDITIES FOR KNITTING MILLS

Area	Textile		
	Wool	Cotton	Rayon
	Relative Humidity, %		
Stock, storage	65	60	55
Warping	65	60	55
Winding	60	60	55
Knitting	65	60	60

(To be continued)

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